This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google books

https://books.google.com

UG
635
G7A4
1918

R.A.F. FIELD SERVICE POCKET BOOK.

APRIL, 1918.

Digitized by Google

UG 635
G7A4
1918

Digitized by Google

H. R. Raikes

R.A.F. FIELD SERVICE POCKET BOOK.

APRIL, 1918.

THIS book is intended primarily for the use of Equipment Officers. It contains information that is not easily accessible in any official publication. Owing to the fact that conditions alter so quickly in aviation, parts of it will very quickly get out of date unless amended from time to time.

Digitized by Google

INDEX.

SECTION 1.

ENGINES.

	PAGE.
General Note	6
Clerget	5
Le Rhone	7
R.A.F. 3A	8
R.A.F. 4A	9
Beardmore	10
B.H.P.	10
Fiat	11
Hispano Suiza	12
Sunbeam	16
Rolls Royce "Falcon"	16
Rolls Royce "Eagle"	17
Magnetos	18
Engine Revolutions	18
Petrol Capacities	19
Propellers	19

SECTION 2.

MECHANICAL TRANSPORT.

Care and Maintenance of	23
General Notes on Movements	31
On Rescuing M.T. Vehicles	33
Useful Information—	
Dimensions	34
Capacities and Consumptions	34
Space occupied by transport of a Squadron	35
Dimensions of Chassis	35
Equipment of Heavy Tenders	35
G.R.O.'s (Extracts)...	35

SECTION 3.

STORES.

How and where obtained	40

Digitized by Google

SECTION 4.

Huts, Tents and Hangars.

PAGE.

Accommodation, Sizes and Capacities 47
On Camouflaging 50
Care and Maintenance 51

SECTION 5.

Salving Wrecked Machines.

Notes on 57

SECTION 6.

General Information.

Army Forms and Books 64
Establishments 65
Fire precautions 67
U.S. Army. Badges of Rank 70
Vapour Bath 72
Weather—
Barometer Indications 73
Clouds 73
Colour of Sky 74

SECTION 7.

Miscellaneous Data.

Capacities of Trucks and Vehicles 77
Sizes 79
Weights 81

SECTION 8.

Miscellaneous Tables.

A.G.S. Bolts and Nuts, List of 87
Bolts, B.A. and Metric compared 89
Drills, Twist, English and Metric compared 89
Screw-cutting Tools, B.A., B.S.F., Whitworth and Metric 91
S.W.G. in Inches and Millimetres 93
Thermometer, Centigrade and Fahrenheit 94
Rope, Weight and Sizes 94
Wire Cord Steel, Weights and Sizes 95
Full Moon, 1918, dates of 95
Altitude, Metres and Feet compared 96

(B 13672) Wt. w. 4867—R.P. 796 3M 5/18 H & S P./18/183.

Digitized by Google

METRIC.

	PAGE.
Metric and English Equivalents	96
Decimals, Fractions and Millimetres compared	97
Metres to Feet	99
Miles, Knots and Kilometres	99
Lbs. per sq. ft. and Kilogrammes per sq. metre	100
Feet per Minute and Metres per Second	101

INDEX TO ILLUSTRATIONS.

	FACING PAGE
Bristol Fighter on Trailer, showing Padding under Fuselage and Ropes.	58
Sketch of Scout Carrier	60
Plan of Vapour Baths	71
Loading Gauge	84

Digitized by Google

SECTION I.

ENGINES.

The following notes are intended only to serve as a guide, especially in the case of squadrons re-equipping with a new type of engine. New points are continually being brought to light, and, in the case of Hispano engines, new facts regarding interchangeability.

In order to meet this, a blank page has been left against each engine for such notes to be added. This should be kept up-to-date, and the information circulated from time to time by H.Q., R.A.F., noted down. If this is done, the section will be of real use and the information be available in a much more concise and handy form than on numerous letters and sheets of note-paper.

The magnetos and sparking plugs shown are all those which can be used. The first sparking plug in the list, when marked with asterisk, is the standard, others are alternatives if the first-named is not available.

The parts shown in the list, which go to complete the engine, are to be returned with each unserviceable engine.

A pamphlet, "Notes on Precautions to be taken with regard to Engines in Cold Weather," is issued by H.Q., R.A.F., and must be consulted on this subject.

130-H.P. CLERGET.

Issued complete with :—

Propeller boss.
Rear support.
Backplate.
High-tension lead and shrouded distributor.
Magnetos.
Oil pump.

Magnetos.—

A.D.S.
D.A.L.

Sparking plugs.—

K.L.G. F. 9.
Oleo 32.
Oleo 27 G.
Joly A. 1.
R.E.V.

Digitized by Google

General Notes.

The chief difference between the old 110-h.p. and 130-h.p. is new type piston, gudgeon pin and connecting rods, and the inlet-valve group, which is larger in the later type.

The parts for the French and English engine are not entirely interchangeable. The main differences are :—

French. Cylinders.—Interchangeable with Gwynnes, but not with Ruston Proctors.

French. Inlet-valve seat not interchangeable with 130-h.p. English. No bush fitted.

French. Inlet-valve spring.—Same as 110-h.p. English.

French. Inlet-valve spring cap.—Same as 110-h.p. English.

French. Crankshaft and maneton complete.—Oil hole connecting crankshaft with central support not in line with oil hole in English central support. 2 mm. difference in position of portion screwed to take nut for securing thrust bearing. No doping tube fitted.

French. Rear drum.—Not screwed to take nut securing thrust race. Spacing of bolts securing rear drum varies in French engines. In some cases they are equally pitched and sometimes in pairs.

French. Air and oil pumps.—Combined type, *i.e.*, the air pump is secured to and driven through the oil pump.

French. Magneto pinion hub.—Different length to English.

French. Thrust or rear bearing.—8 mm. wider than English, and has double race instead of a single one.

French. Central support.—Has holes for magneto pinion cut diametrically opposite each other; this is not so in the English.

French. Rear support.—Eight bolt holes. English has only six and has a longer flange.

110-h.p. and 130-h.p. exhaust valves are interchangeable.

110-h.p. and 130-h.p. inlet valves are not interchangeable.

Inlet-valve seat is not interchangeable on 110-h.p., 130-h.p. or French engine.

Inlet-valve spring.—110-h.p. Le Rhone spring may be used if the Clerget is not obtainable. Spiral exhaust spring used on English engines. Grasshopper or Mousetrap type used by Navy and on new French engines.

Digitized by Google

For the Kauper gear on Sopwith Camels, a shrouded distributor must be used so that the Kauper cam may be riveted to it. The French distributor with toothed periphery may also be used for this purpose.

Two types airscrew hubs are in use, viz. :—

(1) Nosepiece and propeller boss combined.
(2) Propeller boss separate from nosepiece.

Carburettor proper is interchangeable with 110-h.p. Le Rhone, with exception of locking ring securing it to crankshaft, which differs slightly.

The only difference between the Long Stroke and Short Stroke Clerget is in the crankshaft and maneton and the cylinders. Cylinders suitable for Long Stroke engines have 2 sparking plugs in the leading side of the cylinder.

110-H.P. LE RHONE.

Issued complete with :—

Propeller boss.
Backring of crankshaft, or centralising collar.
Backplate.
Carburettor.
Magnetos.
Oil pump.
Nuts, bolts and washers for backplate.
Sparking plugs.
High-tension lead.
Carbon brush holder.
Distributor.

Magnetos.—

D.A.L.
A.D.S.
P.M.A.

Sparking plugs.—

K.L.G. F. 9.
Oleo 32.
Oleo 27 G.
R.E.V.
Joly A. 1.

Digitized by Google

General Notes.

The only difference between engines marked 110-h.p. and those marked 120-h.p. is the brass nameplate. All 110-h.p. Le Rhones are now fitted with aluminium piston and develop over 120-h.p.

The cast-iron piston is now obsolete.

The inlet and exhaust valves are interchangeable.

The standard valve rocker "T" piece, French and English, has an internal diameter of 10 mm. The old type was 12 mm. and was found to have insufficient strength.

French cams are used in preference to English ones.

New English cams to Alteration No. D. 384 (when available) will only be used.

English "T" pieces are preferable to French ones.

For D.H. 5 machines a special centralising collar is made which has a wider flange than the standard one. With the same machine, the back plate is interchangeable, providing a special adaptor ring is fitted.

Tappet and "T" piece safety straps of special design require to be fitted, they are available on indent at Aircraft Depôts.

200-H.P. R.A.F. 3 A.

Issued complete with :—

Magnetos.
Sparking plugs.
Carburettors.
Triple oil pump.
Propeller boss, &c.

Magnetos.—

B.T.H.
A. 6.
A. 6 S.

Sparking plugs.—

Mica B. 3 point.
K.L.G. F. 5/2 B.
Lodge B three point.

General Notes.

Carburettors used are Claudel Hobson, which only differ from those used on 140-h.p. R.A.F. in so far that they have controls at the rear.

It is a 12-cylinder V type, water-cooled engine.

Two kinds of pistons are used, low compression which are

Digitized by Google

48 mm. from centre of gudgeon pin to piston head, and high-compression, which are 53 mm. from centre of gudgeon pin to piston head.

No components are interchangeable between inlet and exhaust valve units. New type valves, which have a longer neck on stem than the original type and are specially heat-treated, are to be used in preference to others. They are stamped "H. & T."

140-H.P. R.A.F. 4 A.

Issued complete with :—

Engine top cowl plate.
Engine cowl back plate.
Cylinder baffles.
Carburettor.
Magnetos complete with straps.
Double oil pump.
Sparking plugs.
Propeller boss.

Magnetos.—

A. 6.
A. 6 S.
C.A.V. hand-starting magneto.

Sparking plugs.—

Lodge A. single point.
Lodge B. three point.
Lodge A. three point.

General Notes.

This is a 12-cylinder V type, air-cooled engine, with propeller mounted on an extension of the camshaft. It is made by two different firms, viz. : Daimler and Siddeley Deasy. There are very few parts which are not interchangeable. The chief, however, of these are the inlet valve seatings and the induction manifolds.

In the Daimler engine, the induction manifold is connected to the inlet valve seatings by rubber pipe connections and two clips. The Siddeley Deasy has merely a rubber jointing washer held in position by the pressure between the two parts.

B. and B. carburettors and hot air muffs are now used on all R.A.F. 4 A. engines.

Aluminium pistons are now used exclusively.

Digitized by Google

160-H.P. BEARDMORE.

Issued complete with :—

Oil pump.
Water pump.
Water manifold.
Induction manifold.
Magnetos.
Magneto cover.
Carburettor.
Sparking plugs.
Propeller boss.

Magnetos.—

D.U. 6.
D.U. 6 S.

Sparking plugs.—

Lodge B. three point.
K.L.G. F. 7.

General Notes.

Zenith carburettors, type 48 R.A., are now used in place of Beardmore type. This necessitates a new type induction manifold as well.

Inlet and exhaust valves are interchangeable.

All new holding-down bolts and studs have B.S.F. threads. The old type were B.S.W.

Propeller boss bolts on the Armstrong-Whitworth machine are 7 inches long, *i.e.*, ½ inch longer than usual.

Exhaust manifolds vary for each type machine.

Radiators vary for each type of machine, *i.e.*, honeycomb pattern for F.E. 2 B. and a tubular type fixed like inverted V on Armstrong-Whitworth.

230-H.P. B.H.P. ENGINES.

Issued complete with :—

Oil pump.
Water pump.
Water manifold.
Induction manifold.
Magneto.
Carburettors.
Sparking plugs.
Propeller boss.

Digitized by Google

Magnetos.—
A. 6 and A. 6 S.

Sparking plugs.—
Siddeley Deasy.—K.L.G. F. 6 or Lodge K single point ordinary, with 18 mm. thread.
Lodge B three point.

General Notes.

This is a 6-cylinder vertical water-cooled engine, with cylinders in blocks of three.

The engine is made by two firms, viz.: Galloway and Siddeley-Deasy and although both follow the same principle of design and have the same bore and stroke, yet they are quite dissimilar and very few parts are interchangeable. It is not anticipated that any more Galloway engines will be sent to the E.F.

Each engine has one large inlet and two smaller exhaust valves to each cylinder.

The exhaust valves are operated by the cams striking directly on the tappet or valve head. The inlet valves are operated by valve rockers.

260-H.P. F.I.A.T.

Issued complete with :—
Propeller boss.
Top water manifold.
Magnetos.
Sparking plugs, &c.

Magnetos.—
Siemens W.B. 6 S, or
Dixie 60.

Sparking plugs.—
Joly B. 3.
Oleo 7 special.

General Notes.

A 6-cylinder vertical, water-cooled engine, similar to Mercedes, having two inlet and two exhaust valves to each cylinder.

Dixie magnetos are usually replaced by Siemens.

Digitized by Google

Engines received from England will be fitted with either Dixie, or Siemens magnetos. If difficulty is experienced in starting, one Dixie may be replaced by a Watford with a self-starting terminal, and in this case a strap must be fitted over the Watford. All Fiats turned out at the E.R.S. will be fitted in this latter manner.

HISPANO-SUIZA ENGINES.

Engine is considered complete without exhaust manifolds, but propeller boss is considered an integral part of engine and must be issued and received with each engine.

Magnetos.—
B.T.H.
A. 8.
A. 8 S.
S.E.V.

Sparking plugs.—
K.L.G. F. 7.
R.E.V. Hispano.
Ponsot.

General Notes.

There are several types and makes of this engine in use at the present time. The principal types are :—

	Designation.	
Non-geared high-compression English engine with traverse magneto shaft as on 200-h.p.	Viper.	
Geared engine with reduction gear, 35–59, *i.e.*, prop. revs.; engine revs., 1186, 2,000	200-h.p., 1170 gear	Name of maker to be added.
Geared engine with reduction gears, 24 : 41; prop. revs. 1,170 when engine is doing 2,000	200-h.p., 1170 gear	
Geared engine with reduction gear of 21 : 28; prop. revs. 1,500 when engine is doing 2,000.	200-h.p., 1500 gear	

There are two compression ratios, and consequently two different types of pistons used on these engines.

Digitized by Google

Low compression ratio is about 4·7 to 1. The piston for this type is 46 mm. from centre of gudgeon pin boss to the crown of piston.

High-compression is 5·3 to 1. This piston has a length of 50 mm. between centre of gudgeon pin boss to the crown.

All Viper engines have the 5·3 ratio, and all engines with the 1500 gear are either turned out by the makers with the high-compression or are being converted to it.

The Zenith 58 D.C. carburettor is fitted to most Hispano engines, but a few have the Zenith 55 D.C. and others a Claudel carburettor.

The 58 D.C. carburettor was not entirely successful at first and has undergone two modifications, known respectively as M. 1 and M. 2. The latter is now the standard carburettor and is being fitted to all the engines.

If it is desired to change type of carburettor, the act of induction pipes must also be changed.

Propeller bosses are not interchangeable between the French and English engines; a different type of key on propeller shaft being used for each.

The water pump is interchangeable on all English engines.

A double "oil pump" is fitted to all 200-h.p. English (geared) engines, and also to all Viper engines.

A single "oil pump" is fitted to all French engines, with the exception of those in the 200-h.p. Spad.

English and French valves are interchangeable as regards size, but the majority of French valves are not suitable for use on exhaust side of high-compression engines. English valves are marked with different letters to denote the material of which they are made:—

"N"	25 per cent. nickel steel.
"T"	Tungsten steel.
"C"	High chromium steel.
"S"	Vickers case-hardening nickel steel.
"Cobalt"	"Cobaltcrom" steel.
"Exps. 'E'"	Express "E" steel.

"T," "Exps. 'E'" or "C," the last with thick heads, are the only ones suitable for the exhaust valves of the high-compression engines. All kinds are suitable for inlet on high-compression, or inlet or exhaust on low-compression engines.

The exhaust manifolds of the Spad, S.E. 5 and Sopwith Dolphin, all differ.

A table of interchangeable parts is attached. This is only tentative and space is left so that other parts may, from time to time, be added.

Digitized by Google

INTERCHANGEABILITY OF HISPANO-SUIZA ENGINES.

Name of Part.	150-h.p. English.	Viper.	150-h.p. French.	200-h.p. English.	200-h.p. H.S. French.	200-h.p. Brazier.	200-h.p. Peugeot.	200-h.p. D.F.P.	Remarks.
Camshaft, complete ...	111748*	*	*	*	*	*	*	*	
Camshaft bearings, front, complete	111620*	*	11008*	*	*	*	*	*	
Camshaft bearings, centre, complete	111621*	*	9968*	*	*	*	*	*	
Carburettor, Zenith, 48 D.C.	*	—	*	—	—	—	—	—	
Carburettor, Zenith, 58 D.C.	—	†	—	†	†	—	†	—	
Carburettor, Claudel Levallois	—	—	—	—	—	‡	—	‡	
Connecting rods, complete	111740*	‡	†	*	†	‡	†	†	
Small end bearings ...	111471*	*	9635*	*	*	*	*	*	
Top covers, complete, R.H.	111440*	*	9612‡	*	—	—	—	—	
(French—cover water-jacket aluminium) L.H.	111437‡	‡	10383*	‡	*	—	—	—	
Gudgeon pin (piston) ...	111841*	*	11030*	*	*	*	*	*	
Pistons, low compression	111741*	—	*	*	*	—	—	*	
Pistons, high compression	—	11528†	—	—	—	†	†	—	
Rings, piston, R.H. ...	111474*	*	595P*	*	*	*	*	*	

Digitized by Google

Rings, piston, L.H. ...	111475†	†	595P†	†	†	†	†	†	
Rings, scraper	111625‡	‡	596P‡	‡	‡	‡	‡	‡	
Valves, exhaust and inlet	111940*	*(a)	*	*	*	*	*	*	
Propeller boss	‡	*	†	*	§	§	§	§	
Propeller boss bolts ...	114066†	*	—	113255*	‡	‡	‡	‡	150-200-h.p. French are not interchangeable.
Induction pipes ...	—	*	—	114848*	†	‡	†	‡	
Pumps, water, single delivery	—	—	†	—	*	—	*	—	For Spad.
Pumps, water, double delivery ...	113432*	*	—	*	*	*	*	*	For S.E. 5.
Pumps, double, oil ...	—	*	—	113437*	—	—	—	—	
Pumps, air	*	*	*	115345*	*	*	*	*	
Pumps, oil, single ...	113433*	—	†	—	*	*	*	*	
Propeller shaft, 1,500 gear	—	—	—	—	—	*	*	—	
Propeller shaft ball-bearings (double row type) 60×110×28	—	—	—	115147*	*	*	*	S. 212A*	
Propeller shaft ball-bearings in rear cover	—	—	—	113234	—	—	—	—	
Propeller shaft thrust ball-bearings	—	—	—	112199*	11006*	—	*	*	
Ignition wires	*	*	*	*	*	*	*	*	Interchangeable on all engines.

Note.—Similar symbols on the same line indicate interchangeability.

(*a*) English valves should always be used in preference to French. Valves are interchangeable on all engines (inlet and exhaust), but on high-compression engines, valves marked "T," "Express E" or "C," must only be used for exhaust and the last only when with thicker heads.

Digitized by Google

SUNBEAM ENGINES.

Sparking plugs .... Lodge single point.

ROLLS ROYCE "FALCON."

Issued complete with :—

Magnetos and straps.
Oil, air and water pumps.
Induction manifolds and carburettors.
Water manifolds R. and L.H.
Sparking plugs and High-tension leads.

Magnetos.—

Watford B. 6 and C. 6.
Fellows E.M. 6.
Coventry P.M. 6.

Sparking plugs.—

K.L.G. F. 5·2.
Lodge, annular gap.
Lodge K, single point.

General Notes.

There are three series of the "Falcon" engine at present, known respectively as :—

Series I	190, developing about	190 B.H.P.
Series II	190	,, ,,	250 B.H.P.
Series III	190	,, ,,	260–270 B.H.P.

Vales, springs and valve guides of Series I, II and III are not interchangeable.

Single oil pump, Series I and II, interchangeable, but not interchangeable with the "Eagle" pump, which is a double one.

Tachometer drive, Series I and II, interchangeable.

Water pump, Series I and II, interchangeable. Pump itself but not drive is same as that used on the "Eagle" engine.

Cylinders, Series I, II and III, are not interchangeable.

Propeller boss, Series I, II and III, are interchangeable.

Oil filter in bottom of sump interchangeable. Series I and II also with "Eagle" engine.

Valve gear, Series I, II and III, not interchangeable.

Carburettors and induction pipes for Series III engine are not interchangeable Series I and II.

Two magnetos only are fitted to "Falcon" engines.

Magnetos on all three series are interchangeable.

When parts for this engine are indented for, the numbers and series of engines for which the part is required must always be quoted

Digitized by Google

ROLLS ROYCE "EAGLE."

Engine is considered complete for issue and receipt if propeller boss is fitted in addition to integral parts of the engine. Exhaust manifolds are not required.

Magnetos.—
Watford B. 6 or C. 6.
Fellows E.M. 6.
Coventry P.M. 6.

Sparking plugs.—
K.L.G. F. 5·2.
Lodge K, annular gap.
Lodge Aero, three point.

General Notes.

There are eight series of this engine :—

Series No.	Engine No.	Actual B.H.P.
I	1/250/1 to 1/250/100	240–250
II	2/250/1 to 2/250/40	260–270
III	3/250/1 to 3/250/110	270–280
IV	4/250/1 to 4/250/150	270–285
V	1/275/1 to 1/275/100	285–305
VI	2/275/1 to 2/275/300	305–322
VII	3/275/1 to 3/275/200	305–322
VIII	4/275/1 to 4/275/—	360–380

Propeller boss, Series I–VII, interchangeable.
Camshafts and casings, Series V–VII, interchangeable.
Camshafts and casings, Series I–IV, interchangeable.
Camshafts and casings, Series VIII.—Special.
Air pumps and tachometer drives, Series I.–V, interchangeable. Fitted to end of camshaft.
Air pumps and tachometer drives, Series VI–VIII, interchangeable. Fitted to cross shaft at rear of engine.
Water pump and drive, Series I–VII, interchangeable. Series V–VII are fitted with large drain tap, E. 9635, instead of small one, E. 9745.
Water pump, Series VIII, has a four-bolt square flange fitted.
All "Eagle" engines are now being fitted with four magnetos.
When complete units for these engines are indented for on a depôt, the number and series of the engine should always be quoted.

Digitized by Google

MAGNETOS.

D.A.L., D.A., B.S. 1, A.D.S., P.M.A., Gibaud, Avia, and Lavalette magnetos may be used on any 9-cylinder rotary engine. The only non-interchangeable part is the driving pinion.

High-tension leads are interchangeable on all rotary engines. The best type is that having a spring sliding sleeve of vulcanite at each end.

Keep all spare magnetos warm and dry.

TABLE OF ENGINE REVOLUTIONS.

Type of Engine.	Normal full Speed.	Maximum Permissible Speed.
Beardmore, 160-h.p.	1,350	1,450
B.H.P., 200-h.p.	1,400	1,500
Clerget, 110-h.p. and 130-h.p.	1,250	1,300
Clerget, long stroke	1,250	1,300
B.R. 1	1,250	1,300
Hispano-Suiza Viper	1,800	2,100
Hispano-Suiza, geared 200-h.p. (French or English)	2,000	2,100
R.A.F. 3A	1,750	1,900
R.A.F. 4A	1,800	2,000
Le Rhone, 110-h.p.	1,250	1,300
Le Rhone, 110-h.p. with aluminium pistons	1,250	1,350
Rolls Royce, Falcon, Series I	2,000	2,100
Rolls Royce, Falcon, Series II	2,000	2,250
Rolls Royce, Falcon, Series III	2,200	2,300
Rolls Royce, Eagle, Series I to IV inclusive	1,800	1,900
Rolls Royce, Eagle, Series V to VIII, inclusive	1,800	1,900
Sunbeam	,000	2,100

The rates of revolution given in the column headed "Normal full Speed" are the speeds that may be maintained continuously for periods of three hours or more at a time.

The rates of revolution given in the column headed "Maximum Permissible Speed" are the speeds at which it is permissible to run the engine for short periods only (say 5 minutes).

Digitized by Google

PETROL CAPACITY.

	Gallons.
Armstrong-Whitworth	46
Bristol Fighter	46
Camel Clerget	27
Camel Le Rhone	27
D.H. 4	64
D.H. 4, with extra tank	82
D.H. 9	72
Dolphin	29
F.E. 2B	50
F.E. 2B, with extra tank	59
R.E. 8	47
S.E. 5	30
Spad, 200-h.p.	24

LIST OF PROPELLERS.

Machine.	Engine.	Standard.	Alternative.
Armstrong-Whitworth	160-h.p. Beardmore ...	L.P. 2390A ...	L.P. 2400
Bristol Fighter ...	Falcon Series I ...	3032 L.H. ...	—
		3033 R.H. or 3051 ...	—
Bristol Fighter ...	Falcon Series II ...	3044 L.H. ...	—
		3045 R.H. ...	—
Bristol Fighter ...	Falcon Series III ...	3032 L.H. ...	—
		3033 R.H. or 3051 ...	—
Bristol Fighter ...	200-h.p. Hispano (1500)...	P. 3046 ...	—
Bristol Fighter ...	Sunbeam Arab	8210	—
Camel Clerget ...	130-h.p. Clerget	A.D. 644 ...	—
Camel Clerget ...	Longstroke Clerget ...	A.D. 644 ...	—
Camel Le Rhone	110-h.p. Le Rhone ...	A.D. 644 ...	—
D.H. 4	B.H.P.	A.B. 7031 ...	A.B. 7151, 1329.
D.H. 4	Eagle Series, 1 and 2 ...	2450 L.H. ...	—
		2451 R.H. ...	—
D.H.4.	Eagle Series, 3 and 4 ...	1343 L.H. ...	—
		1344 R.H. ...	—

Digitized by Google

LIST OF PROPELLERS—*continued.*

Machine.	Engine.	Standard.	Alternative.
D.H. 4	Eagle Series, 6 and 7 ...	A.D. 671 R.H.	—
		A.D. 672 L.H.	—
D.H. 4	Eagle Series, 8	2610 L.H. ...	—
		2611 R.H. ...	—
D.H. 4	Fiat	7865	A. 1659.
D.H.4.	R.A.F. 3 A.	A.B. 2496 ...	A.B. 2442.
D.H. 9	B.H.P.	A.B. 7151 ...	—
Dolphin	200-h.p. Hispano...	L.P. 3610 ...	L.P. 3800.
F.E. 2 B. ...	160-h.p. Beardmore ...	L.P. 3120 ...	L.P. 982A.
			T. 5638.
R.E. 8	R.A.F. 4 A.	T. 6296 ...	T. 28008.
S.E. 5	200-h.p. Hispano (1500)...	8080	T. 28137.
S.E. 5	Wolseley Viper	7673	A.B. 761.
			A.B. 662.
180-h.p. Spad ...	180-h.p. Hispano, English	A.B. 767 ...	A.B. 761.
180-h.p. Spad ...	180-h.p. Hispano, French	A.B. 765 ...	A.B. 755.
200-h.p. Spad ...	200-h.p. Hispano ...	I.P.C. 2224 ...	—

Digitized by Google

Digitized by Google

Digitized by Google

SECTION II.

MECHANICAL TRANSPORT.

Care and Maintenance.

General.

It cannot be too strongly impressed that constant supervision is essential and that strict attention to detail will make all the difference to the running of a vehicle.

The most essential thing in connection with the running of a vehicle is the greasing and oiling. This point rarely has sufficient attention and many breakdowns are caused through lack of attention in this respect.

Vehicles well greased ride better, last longer, and are much easier to handle.

Every driver, no matter how many hours daily he is on the road, has plenty of time to go round his vehicle and give the greasers a turn or two while waiting. A large amount of the replacements necessary are due to wear caused by neglect of greasing.

On inspection, make sure that all rear spring platforms, the shackle bolts, brake controls, &c., are well lubricated.

M.T. Drivers.

It should be impressed upon all drivers that, should they discover the slightest defect in the running of a vehicle, they are immediately to inform their N.C.O. in charge, who should take immediate steps to have the matter remedied. A short time spent in repairing a small tear in the hood, or replacing a missing bolt or greaser, often saves a costly renewal. The paintwork of vehicles, after some months of use, naturally gets bad, but this is no excuse for letting the engine, gear-box and chassis get into a filthy condition.

Drivers should be given orders that, before cleaning the outside of a vehicle, they are to attend to the inside. This is a very important point and often a fine looking vehicle from the outside point of view gets hung up on the road, simply because no attention has been given to the internal cleanliness.

Many drivers are apt to depart from the standard fitting of a vehicle and fit parts which are not supplied. This should be

Digitized by Google

stopped, and no alteration allowed to any part of the transport other than standard. There is a great tendency to make holes in the silencer case and discard tail pipes, which mean new parts have to be fitted during overhauls.

Log Books.

Special Army Book No. 412 is issued for use in connection with transport, and one of these books should be carefully kept for each vehicle. Care taken in entering these books with a record of work done to the vehicle helps the repairer and saves a lot of unnecessary work. Care should be taken in entering the record of petrol consumption; this can then be watched, and, if excessive, steps should be taken to remedy it. A specimen page of a log book is given below, and the following rules should be observed:—

(1) All repairs, "running" or otherwise, must be entered, stating the work done, the material used and the mechanics employed.

(2) The changing of oil in the engine sump every 14 full working days must be recorded.

(3) An entry should be made in respect of each fortnightly tool check.

(4) All entries in the log book will be signed by the E.O. of the unit to which the vehicle in question is on charge.

Speed Limits.

Strict instructions should be given as to speed limits over bad roads. Replacements of springs and fittings are largely due to carelessness of drivers in bumping over bad roads.

Frost.

A special memorandum, S.S. 612, is published on the precautions to be taken during cold weather and this must be consulted, and all precautions taken.

Hints.

A funnel with copper gauze should always be used when filling up with petrol.

A vehicle should always be started by an upward pull. Many needless accidents occur when starting by pushing the starting handle down.

Digitized by Google

SPECIMEN OF LOG BOOK SHEET.

Date and Time in Shops.		Nature of Defect and Repairs.	Replacements and Stores used.	Names of Fitters.	Signature of Officer i/c Workshops.
In.	Out.				
21.3.16	21.3.16	Engine sump cleaned out; refilled with fresh oil	2 gallons Vacuum BB oil	1/A.Ms. Smith, Jones	S. Gow, 2nd Lieut. E.O., "N" Squadn.
26.3.16	26.3.16	Tools and equipment checked. Deficient—1 wire wheel spanner	1 wire wheel spanner. Driver — 1/A.M. Youde	Checked, Sgt. Humphrey	S. Gow, 2nd Lieut. E.O., "N" Squadn.
3.4.16	4.4.16	Front axle bent in collision with Heavy Tender M. 1766	New front axle fitted. U/s. front axle returned to "Z" A.P.	Cpl. Miller ... 1/A.M. Green	S. Gow, 2nd Lieut. E.O., "N" Squad.

Digitized by Google

INSTRUCTIONS FOR CARE OF CROSSLEY CARS AND LIGHT TENDERS.

Daily Inspection.

All greasers should be turned and the vehicle inspected for missing parts, grease caps, &c. Particular attention should be paid to the grease caps which are least accessible, as these are very frequently overlooked.

All vehicles should have a regular day-in once a week, and the following points attended to :—

Weekly Inspection.

1. *Oiling.*

Engine.—Once every full 14 working days the oil in the sump should be drained out and fresh engine oil put in. Run engine DEAD SLOW for 10 minutes after the above operation.

Magneto.—Put only slightest trace of oil on magneto bearings. Excessive oil on magneto causes ignition trouble

Gear-box. Use engine oil only in gear-box.—Grease must on no account be used. Replenish when necessary.

Back axle.—Thick cylinder oil may be used in the back axle.

Various.—The following should also be kept oiled :—

Spring platforms.
Starting handle bush.
Fan bearings.
Brake and clutch cross shaft.
Change speed cross shaft.
Rear brake operating spindle.

2. *Greasing.*

The following must be kept greased :—

Road wheel bearings.
Steering swivel.
Steering joints.
Clutch trunnion.
Outside of torque ball.

3. *Cleaning.*

Petrol filters.

Tank.—Remove plug from bottom of tank and clean out sediment.

Carburettor.—Remove float chamber and clean out sediment.

Magneto.—Distributor and platinum points.

Sparking plugs.

Digitized by Google

4. *Adjustments.*

Take up play in all steering joints with car jacked up.
Tighten wheels on hubs.
Adjust foot and hand brakes.
Adjust oil pressure to read 5 lbs. when engine runs slowly.
Adjust sparking plug gap to $^1/_{32}$-inch. In the case of multiple-point plugs, one point only need be set to the above limit; the remainder may be set to $^3/_{64}$-inch.
Adjust valve tappets to give a clearance of $^4/_{1000}$-inch between top of tappet and bottom of valve stem when valve is closed.

Caution.—The jet setting and petrol level in the carburettor must not on any account be changed. Always drain water from engine *and pump* during cold weather.

Examine the following parts for fractures :—
Rear spring frame brackets.
Off-side chassis member at gate.
Both chassis members at radiator trunnion.
Radius rods on both front and rear ends.

INSTRUCTIONS FOR CARE OF 3-TON LEYLAND LORRY.

Daily Inspection.

All greasers should be turned daily and the vehicles generally inspected for any missing parts, grease caps, &c.
Oil the following daily :—
Oil plug on flywheel cover.
Two oil plugs on front road wheels.
Two oil plugs on rear road wheels.
One oil plug on spherical thrust member.
Two oil plugs on cardan die boxes.
All vehicles should have a regular day-in once a week and the following points attended to :—

Weekly Inspection.

1. *Oiling.*

Engine.—Once in every 14 full working days the oil in the sump should be drained out, and fresh oil put in.

Caution.—Run engine DEAD SLOW for 10 minutes after the above operation.

Magneto.—Put only one or two drops of oil on magneto bearings weekly. Excessive oil on magneto causes ignition trouble.

Digitized by Google

Gear-box.—Use heavy cylinder oil in gear-box—*no grease* must be used. The quantity required brings the oil level up to the higher of the two cocks placed on the near side of the gear-box. The lower one is intended to show the minimum level; and when the oil gets below this more oil must be added. Oil level must be examined weekly.

Back axle.—Use heavy cylinder oil—*no grease* must be used. Oil level must be examined weekly.

Various.—The following should also be oiled weekly :—

All steering connections.
Side brake connections.
Foot brake connections.
Clutch pedal and connections.

2. *Adjustments.*

Take up play in all steering joints.
Adjust hand and foot brakes.
Adjust valve tappets to give a clearance of $^4/_{1000}$-inch between top of tappet and bottom of valve stem when valve is closed.

Examine the following parts :—

Front spring clips; these often work loose.
Arm on steering column; if these are allowed to become loose on worm-wheel shaft considerable damage is done to the steering.
Centre bearing bolts on engine occasionally become loose. These must be tightened when necessary.
All road wheels should be removed once a month to see that the backs of the wheel bearings are getting grease; at the same time, the wheels can be examined to see if the rivets are working loose.
Propeller tube; this often fractures close to the torque ball.
Rear axle casing; fractures radiate from side axle tubes.

Note.—A leakage of oil from the gear-box on old type chassis can be obviated by drilling three $\frac{1}{8}$-inch holes in the oil cap on top of gear-box to act as vents.

All new (5000) type Leyland lorries have a new type gear-box and when changing gear from third to fourth speed, great care is necessary as this type has an internally toothed drive on fourth speed instead of dog clutches, as on the old type. *Force must not be used.* The gears will engage silently and easily if correctly handled.

Digitized by Google

WORKSHOP LORRIES.

The lorry engine of a workshop lorry should be started up occasionally, and the lorry taken for a trip to ensure that it is perfectly mobile.

Tools and equipment should be frequently checked and the repairs to the machinery should be carried out without delay.

When the shop is likely to stay in one place for any length of time, packing blocks should be placed between the chassis and the ground to save the lorry springs and make the shop rigid. This will enable better work to be done on the lathe.

The lighting set runs at a very high speed and the oil in the sump needs very frequent changing. The various motors and dynamo in the workshop require oiling, and occasional attention to the brushes will prevent sparking on the commutator. Care should be taken to keep the commutator quite free from any trace of oil. The mechanic in charge should occasionally wipe the commutator when the dynamo or motor is running. This should be done with a soft cloth. The proper fuse wire should always be used for the fuse board. The tendency to fit heavier fuses than the machines are designed for causes many of the troubles experienced with motors and dynamos.

MOTOR BICYCLES.

The majority of trouble experienced with motor bicycles is caused by the riders not making the proper adjustments when they are necessary.

Front wheel spindles should be kept tight and the spring slide well greased and lubricated through the lubricating channels provided for that purpose.

Particular attention should be given to the lubrication, by oil can, of the hollow gear shaft.

On the near side of the machine a black enamelled cover will be found bearing the words "Remove to oil gear." On inspection this cover should be removed and as much oil as possible forced into the hollow gear shaft through the small red pipe which can be seen.

Each cyclist should be instructed to do this every day.

The head of the machine should be kept adjusted. Play should not be allowed.

Connection levers, carburettor and exhaust box should also be examined for loose bolts. Play in chains should be looked for and instructions given for tightening. Wheels should be examined for broken spokes. Any loose bolts or nuts on engine should be noted and particular emphasis laid on the necessity

Digitized by Google

for keeping clean. Occasional washing out of bearings with paraffin, and refilling with lubricating oil is necessary.

The frames of cycles should be examined frequently to see that no tubes or lugs have fractured—especially on the sidecar machines.

The adjustment of sidecars should be most carefully checked and the true alignment of the wheels is most essential; otherwise breakage of sidecar frame will occur. The fitting of air scoops to carburettor, and fitting of exhaust pipes other than standard, should be forbidden. The altering of the shape of handle bars is also forbidden.

TRAILERS.

These are usually neglected and hardly ever receive attention.

The shackle bolts need grease or oil and the wheel bearings require occasional adjustment, otherwise the roller bearings are broken and the axle soon becomes scrap.

Trailers can often be seen on the road with fully extended pole and only one case being carried on the back, the result being a bent pole and probably a broken frame.

Don't open out trailer unless necessary. It is much stronger in its non-extended position and less liable to be broken.

In hot weather, sacks placed over the wheels when not in use will protect both wheels and tyres from deterioration.

KITE BALLOON WINCHES.

Kite balloon winches should always be kept absolutely clean and in perfect order as the observer's life may depend on the condition of the winch. If a defect is reported by the driver, the E.O. should take immediate steps to have it remedied.

Notes on Care of Winches during Frosty Weather.

1. The radiator of the winch must be emptied when not in use. The water should be drawn off through the drain cock fitted to the water pump, as well as through the plug fitted to the front of the radiator.

2. The water must be run off whilst it is quite hot and on no account should it be allowed to get cold before being drawn off. If it is not convenient to draw off the water immediately after the winch has been working, the engine should again be started up and run sufficiently long thoroughly to gear the water.

3. After the water has ceased to flow, the engine may be started up again and run for about 30 seconds to ensure all the water being driven out of the pump and the lower circulating pipes.

Digitized by Google

4. Care must be taken when refilling the radiator. The drain plug on the pump should be left out until about 2 or 3 gallons of water have been put in. The engine should then be started up and run lightly while the radiator is being filled. A blanket or suitable covering should be placed over the front of the radiator while the engine is running and the fan belt during frosty weather can be dispensed with. It is pointed out that this care is particularly necessary because the radiating circuit of a Scammell winch radiator is much greater than the usual form of car radiator, with the result that if cold water is poured in when the temperature is very low and without the drain plug being left out, there is a possibility of the water freezing at once in the lower end of the tubes. If possible the first 2 or 4 gallons of water used for refilling should be hot, but still the same precaution should be taken of leaving out the drain plug until the circulation is completed. The petrol tank should also be emptied and the cap over the petrol filter removed in order that all the petrol is drawn out of the carburettor and the carburettor pipe. The winch bonnet should always be kept closed, and if the winch cannot be kept in a sheltered spot, it should be covered with a ground sheet.

The Lancia chassis generally used with the Scammell winch requires careful handling. Remember that the total weight of a Scammell winch is 3 tons and that the transmission is not designed to pull this weight through thick mud in second or third speed. The clutch is of the dry plate type and easily burns if allowed to slip. Always change down early and save trouble.

GENERAL NOTES ON MOVEMENTS.

Every unit must always be ready for a move. A plan must be drawn up showing exactly what each lorry is to carry and the order of loading.

An officer must be detailed to go round the camp the last thing before moving off, to ensure that everything has been left clean and tidy, and a fatigue party must be detailed to remain until this inspection has been carried out.

An officer must be responsible for setting the pace at the head of each convoy. It must be remembered that in any convoy of over 12 vehicles, the rear vehicle will frequently have to move at a rate nearly double that of the leading vehicle, in order to keep closed up. The pace set at the head of the column, therefore, must be a very slow one.

Digitized by Google

A convoy should halt every 10 or 15 miles and the officer in charge will then satisfy himself that everything is in order, *i.e.*, trailer loads are not slipping, tyres flat, &c.

A halt should always be called after going up a long hill, to ensure that the column is not opening out.

It should also be remembered that lorry driving on rough or greasy roads is a very tiring job, and that dust seriously affects a driver's powers of endurance. Halts are therefore necessary on this account. Adequate precautions must be taken to ensure that lorries do not lose the way. When moving by night or in the case of difficult roads, it may be necessary to post men at junctions to act as guides. The following method should be adopted: The leading lorry carries a party of men with it, one of whom is dropped at each road junction or turning, with orders to direct the convoy along the right route. Each man is also told the number of vehicles in the convoy and the registration number of the last vehicle. He remains there till the last vehicle reaches him and then accompanies it. This will necessitate the last vehicle starting wholly or partially empty.

When halting, take care that the head of the column is sufficiently far beyond the top of any hill to ensure that the rear of the column does not have to halt on the hill.

In the case of a bad road it may be advisable to send on a party of men with picks and shovels, under an officer or N.C.O., to fill up very bad places, which may otherwise cause a broken spring or even a broken axle.

If a lorry gets into a ditch it will generally make matters worse to try and get it out under its own power. A Leyland lorry will nearly always tow out another one unless the latter is very badly bogged indeed.

Motor cyclists should move ahead of the column in order to give warning of any likely blocks. In the event of it being necessary to proceed by a narrow road where there is not room for vehicles to pass each other, a cyclist must proceed to the further end of the defile and warn other transport not to enter it until the convoy is past.

Two motor-cyclists will move with the last vehicle. One of these will report to the Commander of the convoy every half hour to say whether all is correct, and, if the column is moving at the proper intervals, also at once in the event of a vehicle breaking down.

Attention is drawn to General Routine Orders 1943, 2780 and 2053, para. (*c*), on the subject of road discipline.

Digitized by Google

NOTES ON RESCUING M.T. VEHICLES.

If a vehicle gets ditched the best method of procedure is as follows :—

Lorries.

On arrival at the place, first of all have a good look at the position, and decide if it is better to pull forward or back out of the ditch. If the rear wheel is not badly ditched the lorry can often be removed by engaging first speed or reverse as the case may be, opening all compression cocks, switching engine off and turning engine by hand. This gives a nice easy motion and is generally successful.

If the ground is soft, clear all wheels free with a spade, make a path for the wheel tracks, and tow.

It is generally easier to pull the ditched lorry out backwards. Don't lock quickly if it can be avoided as this makes extra work for the salvage lorry. Always take as much timber with you as you can find—short pieces of 9-inch by 3-inch are very useful.

It is quite useless to try and get a lorry out of a ditch under its own power, unless the earth is dug away and a timber road made. It will simply dig itself in.

If the vehicle is loaded it generally pays to tranship to the breakdown lorry, and saves time in the end.

Never tow a lorry by the axle. The towing hooks are the proper attachment. Get as straight a pull as possible. It saves straining the chassis. See that the undershields are clear of the ground or they will get bent.

Cars and Light Tenders

The same method will remove a car or light tender, but in this case never use a Leyland towing rope or the dumb irons and springs are certain to be bent.

If no hemp rope is available wrap some sacking round the dumb iron and spring before attaching the chain end. Do not pull a car out by attaching to the jockey spring at rear. There are plenty of more suitable places on the frame to which a good fixing can be made. This of course depends on the position of the car in the ditch.

Never let the towed vehicle overrun the tow rope. Keep side brakes applied sufficiently always to keep a tension on the rope. A jerk does a lot of harm to both vehicles. Take the strain gradually on the tow rope when starting.

If the vehicle is damaged so that it cannot be salved by the Squadron, application for assistance should at once be made to the O.C., Army Mobile Repair Unit, A.S.C.

Digitized by Google

USEFUL INFORMATION ON TRANSPORT.

Dimensions.

	Length.	Width.	Height with hood.	Weight Empty.
	Ft. in.	Ft. in.	Ft. in.	T. c. q.
Leyland lorry with driver and full tanks	23 0	7 6	11 6	4 4 4
Crossley tender with driver and full tanks	17 0	6 6	10 0	1 15 2
Crossley car	17 0	6 6	8 0	1 18 1
Trailer (flat)	23 0	7 6	4 0	0 12 3
Motor cycle	7 6	2 9	3 9	0 2 2
Motor cycle with sidecar....	7 6	5 3	4 0	0 3 3
Workshop lorry with extensions and fully extended	26 6	21 6	12 0	6 19 0

Capacities and Consumptions.

	Capacity of Tanks.		Average Consumption Miles to Gallons.	
	Petrol.	Oil.	Petrol.	Oil.
	Gallons.	Gallons.	Gallons.	Gallons.
Crossley light tender	18 + 2	3	12	450
Crossley touring car....	18 + 2	3	14	500
Leyland lorry	28	2½	6	200
Motor cycle	1½	¼	70	1,000
Motor cycle with sidecar	1½	—	55	800

Digitized by Google

Space occupied by Transport of a Squadron.

	Army Squadron. Yards.	Corps. Squadron. Yards.
Frontage in line, lorries and tenders only	43	57
In column of route, 3-feet interval, lorries and tenders only	112	147

Dimensions of Chassis.

	Ft.	in.
Leyland wheel base	14	0
Leyland track	5	4
Lancia overall length	19	9
Lancia overall width	5	11
Lancia wheel base	15	6
Lancia track	4	7½
F.W.D. overall length	16	8
F.W.D. overall width	6	2
F.W.D. wheel base	10	4
F.W.D. track	4	8

Equipment of Heavy Tenders.

C.R.F.C. 1549 (Q.), 30.8.17.

The following are to be carried :—

1 pick.
1 shovel.
1 pair non-skid chains.
1 tow rope.
1 tin petrol.
1 can lubricating oil.
1 petrol tin filled with paraffin.
3 tins water.

All tins used for oil, water or paraffin to be painted black, with white "O," "W" or "P" as the case may be, in large letters on both sides.

Extracts from G.R.O.'s regarding Transport.

General Routine Order No. 944.

All motor cars and motor lorries must have their official registration number painted on the bonnet and also on the back of the vehicle.

Digitized by Google

This number is to be painted on both sides of the bonnet in white paint, in a conspicuous position at the back where it is not likely to be obscured by the tyres, tarpaulins or other obstructions.

The size of the figures in all cases is to be as under:—

For motor cars .... 4 inches high, ½ inch wide.
For motor lorries ... 6 inches high, ⅝ inch wide.

A broad arrow is to be placed on top or on one side of the numbers, according to the shape of the bonnet, as may be found most convenient.

No numbers or letters are to be painted on the bonnets or on the backs of the vehicles except the official registration number.

General Routine Order No. 1032, *dated* 22.7.15 (amended by General Routine Order No. 2780).

Men in charge of horses or of any vehicle, whether horse or M.T., are on no account to halt outside Estaminets or similar places, or to leave their horses or vehicles unattended on the roadside.

General Routine Order No. 1943.

Mechanical transport vehicles when travelling in convoys will be divided into sections, each of six vehicles, and an interval of 25 yards will be maintained between each section.

In order to indicate clearly where this interval is to be left, every sixth vehicle will carry, suspended from the left-hand side of the tailboard, a detachable red disc, 18 inches in diameter, fixed in such a manner as to be clearly visible from the rear and not obscured by the tarpaulin, and will, in addition, carry a red disc of 9 inches in diameter, suspended from the radiator cap or other suitable part of the front of the vehicle.

The rearmost vehicle of each convoy will carry a double red disc, suspended from the left-hand side of the tailboard.

Other vehicles will not approach within 25 yards of any vehicle carrying the red disc except when in process of passing the Column.

Traffic control posts will ensure that these intervals are maintained, in order to prevent obstruction of traffic which is proceeding in the opposite direction to that taken by the convoy.

The discs referred to above will be provided under arrangements to be made by Army Commanders.

Digitized by Google

General Routine Order No. 2780, *dated* 4.11.17.

When two or more men are travelling on a lorry, a "look out" man must invariably be placed at the back of each vehicle in order to warn the driver when vehicles approaching from the rear overtake the lorry.

General Routine Order No. 2897, *dated* 29.11.17.

One-third of the inside upper surface of the glass of each headlight on all motor cars, motor ambulances, motor lorries and motor cycles will be painted with a black or shaded colour.

Officers commanding units on the establishment of which such vehicles are borne, or individuals to whom such vehicles are allotted, are held responsible that these instructions are carried out.

General Routine Order No. 2095, dated 21.1.17, is hereby cancelled.

Digitized by Google

Digitized by Google

Digitized by Google

SECTION III.

STORES.

General Notes on Supply of Stores to E.F.

1. The need for economy in material of all kinds cannot be too strongly insisted upon. Every part salved sets free so much labour to produce new aeroplanes and engines.

Although articles may be unserviceable to a squadron it does not at all follow that they are useless to other people. Nearly every part can be made use of either in this country or in England, and if not valuable for anything else, scrap metal is always wanted. Any parts of aeroplanes, engines, guns, M.T., &c., however badly damaged, must be treated carefully so as to avoid further injury to them, and returned through the usual channels.

In order to ensure the punctual despatch of stores, indents must be made out accurately and a full description given of any particular part wanted. All stores in squadrons must be kept neat and accessible. Engine and M.T. spares must be kept well greased.

A great deal of scope for ingenuity is open in arranging stores so as to have them readily accessible and yet at the same time ready for transport in case of a move. These two fundamentals should always be borne in mind and the result will be a very much easier and orderly move.

No accumulation of surplus stock must be permitted and any surplus must be returned at once to the Aircraft Park.

All workshops tool boxes should be checked at least once a month and any deficiencies indented for at once.

Empty cases and boxes, oil and petrol tins, must never be allowed to accumulate and must be returned at once.

All stores that a Squadron is entitled to hold are shown in A.F. G. 1098 for Squadron and separate appendices for each type of aeroplane and engine. For mechanical transport there are also I. of T. Schedules A. and D., as well as a G. 1098.

In the event of a new type of machine being introduced, it is a great help if Squadron E.Os. will report those parts of a machine which are found to require frequent replacement. By doing this, orders for these particular parts can be increased, thus preventing a shortage of urgently required spares.

2. *Aeronautical stores*, not used by other branches of the service, are obtained by Aircraft Depôts from R.A.F. Stores Depôts in England, and are issued to R.A.F. units in the field.

Digitized by Google

All stores under this heading must be indented for, except such items as aeroplanes, kite balloons and a few others, known as Class "C" stores, which are allotted by H.Q., R.A.F., on application from Brigades, usually by means of returns.

3. *Army Ordnance stores* are common to all arms and are divided roughly as follows:—

(*a*) *Clothing, necessaries and personal equipment* are drawn on indent through the Wing and all unserviceable articles must be returned or paid for, if lost through negligence or made away with. See list of sizes in Section 8.

Boots when unserviceable are repaired at the nearest Ordnance Workshops under Wing arrangements. Free issues are not made to officers. Their boots may now be repaired on payment in Army workshops (G.R.O. 2358).

Revolvers or field glasses, when lost by officers through the exigencies of the service, can be replaced from store. Indents for these must be supported by a certificate signed by the officer and his C.O., and the issue approved by the G.O.C. Brigade or L. of C. Area. Such articles, which become private property, must be stamped with the W.D. Sales mark.

Officers are entitled to draw and retain as their own property three new G.S. blankets. One issue only is allowed.

(*b*) *Camp equipment* (see Section 2A, Mob. Stores Table for a Squadron) is drawn from A.O.D. on demand through the Wing.

(*c*) *Raw materials, &c.*, in the other Vocabulary Sections in the Mob. Stores Table, are obtained by A.Ps. and Aircraft Depôts from A.O.D.

(*d*) *Ammunition, S.A.* ·303 *and Webley pistol* is supplied from the nearest Ammunition Column. (·303 selected, Tracer and Buckingham, and ammunition for automatic pistols is supplied by A.Ds. through A.Ps.)

(*e*) *Standard bombs* are obtained from nearest Ordnance Ammunition Depôt through the Brigade Ammunition Column. Standard bombs are 230 lb., 112 lb., Cooper's and incendiary carcases, Special bombs (phosphorous, &c.), are obtained from Aircraft Depôts.

(*f*) *Machine gun spares.*—Spares for Vickers and Mark I Lewis (all of which, with the exception of the magazine and barrel casing, are interchangeable with Mark II

Digitized by Google

Lewis guns) are supplied by A.O.D. through A.Ps. Parts special to Mark II Lewis guns and all Maxim gun spares are kept by A.Ds.

4. *Special stores.*

(*a*) *Telephone stores* are obtained from A.O.D., but indents must first be passed by the Director of Army Signals.

(*b*) *Goggles for pilots* and observers are now an A.D. supply. *Goggles for M.T. drivers* at the rate of one per vehicle and motor cycle are supplied by A.O.D.

(*c*) *Antiluse*, an anti-dimming composition for goggles and windscreens, is supplied in sticks by A.D's.

(*d*) Special equipment for M.T. vehicles. In addition to the items laid down in I. of T. Schedules, the following will be carried :—

On heavy tender—

1 spade
1 pickaxe } from A.O.D.
1 tow rope, steel, from A.D.

On light tender—1 tow rope, hemp, from A.D.

5. *A.S.C.*—Rations, fuel, lubricants and disinfectants, are obtained from the A.S.C. Supply Officer at the nearest railhead, and are demanded on A.B. 55.

Glasso, an anti-dimming composition for goggles and windscreens, is supplied from this source.

For full particulars as to scales of rations and fuel allowed, see extracts from G.R.O., Q.M.G's. Branch, obtainable from Army Printing and Stationery Depôt.

6. *Stationery* is supplied by the Army Printing and Stationery Depôt with the Army and is demanded on a special form supplied by the Depôt. Stationery includes all published books, office stamps, files, &c.

Green envelopes and F.S. postcards are supplied without indent, the quantities being taken from the unit's weekly strength return

7. *R.E. stores.*—This includes timber, corrugated iron, bricks' cement, paint, &c., to be incorporated in buildings or other fixtures, and is demanded from the Army through Wings, by letter.

8. *Indenting.*—All aeronautical and A.O.D. stores are demanded on A.F. G. 994 (F.S. Indent). These are forwarded to A.Ds. and A.O.D. from Squadrons through Wings and A.Ps. Orders are issued in each unit as to when indents are submitted and renewed and the number of copies to be sent.

Digitized by Google

Stores under each vocabulary and R.A.F. Stores Section must be demanded on separate sheets.

The reason for any extra heavy demand must always be stated, also for all issues of non-expendable stores. If stores are demanded to replace those lost by individuals, a copy of the "Issues on payment voucher" should be attached.

When stores not on Mob. Stores Table are demanded, a separate indent must be used and a written statement attached explaining why they are required.

The word *Urgent* should not be used unless for spares to make an aeroplane, aero engine or vehicle serviceable, and only the quantities required for this purpose should be asked for as *Urgent*. On an aeroplane becoming unserviceable, the parts required to complete it must be telegraphed or telephoned for to the A.P., and if not available there the A.D. must be asked by wire to supply whether the stores are on indent or not. All such demands must be prefaced by the word "SPECIAL," which is to be used exclusively on telegrams for items required to render an aeroplane or engine serviceable. When possible the unserviceable part should be sent by orderly as a sample.

Part or A.G.S. numbers should always be quoted and the same description used as are laid down in the Mob. Table or Schedule.

Parts for machine tools must be fully described and the maker's name, number and the size of the machine quoted.

Aero engines are supplied with the fittings as laid down by H.Q., R.A.F. (see under "Engines").

Heavy and light tenders, motor cycles and sidecars, when issued in exchange, are supplied without tools and accessories.

Workshop lorries when issued in exchange are supplied with all machine and hand tools, but without chassis tools.

When the above vehicles are a first issue they will be complete, as laid down in I. of T. Schedules (but less tow ropes, spades and pickaxes), in the case of light and heavy tenders.

Trailers are always issued and returned complete with tools and spare rims.

9. *Accounting.*—Although units in the field are non-accounting, *i.e.*, do not keep ledgers, they are responsible that non-expendable stores are signed for and on some individual's charge, so that they may be made to last for a reasonable period and returned when worn out and finished with. Some system of recording these must therefore be adopted.

Expendable stores must be used as economically as possible. At present a rough account of these is kept by squadrons in a loose-leaf stock sheet in covers, which are supplied by A.Ds.

Digitized by Google

Stores lost by W.Os., N.C.Os. and men which cannot be satisfactorily explained, are charged against them on A.F. W. 3069, entered in the individual's pay book and the form forwarded to Command Paymaster's Base, in duplicate.

Stores lost by or issued on repayment to officers are charged against them on A.F. W. 3225, which is forwarded to the Command Paymaster.

The prices of such articles lost must be assessed from the best information available, and in the case of worn articles must be not less than one-quarter new value.

Priced lists of Ordnance stores can be obtained from A.O.D. and A.Ds. can quote the prices of most other articles.

10. *Returning stores.*—As a rule all stores serviceable are returned to the source of supply through the same channels as received.

Particular attention must be paid to the return of all packing cases, tins, oil drums, &c.

Unserviceable Crossley and P. and M. tyres are sent to the M.T. Base Depôt, through railheads, in accordance with local orders.

All unserviceable metal parts must be returned to A.Ps. Scrap aluminium is sent from these to England through A.Ds. other scrap metal goes to the Ordnance.

Unserviceable aero engines, propellers, &c., must be returned properly packed in their cases. Log books must always accompany engines and be marked up according to standing orders.

With regard to the return of fabric parts, squadrons must take the greatest possible care of unserviceable planes sent into Aircraft Parks for repair. A crashed plane should be just as carefully packed for return to the Park as is the serviceable plane issued in replacement. It causes a great waste of time and material if it is found on stripping a plane that half-a-dozen ribs and the trailing edge have been ruined simply through careless packing.

When returning M.T. vehicles for replacement, everything should be complete. If grease cups are taken off a tender it not only causes a lot of unnecessary correspondence, but actually holds up the delivery of overhauled vehicles.

When motor cycles are returned as unserviceable, they should also be carefully packed in the tender or lorry. An immense amount of avoidable damage would be obviated if this were done.

When serviceable but obsolete or surplus spares and stores are returned they must be carefully packed.

It should be borne in mind that obsolete and out-of-date spares in France are very often badly wanted in England for use on training machines.

Digitized by Google

Digitized by Google

Digitized by Google

SECTION IV.

HUTS, TENTS AND HANGARS.

Scale of Accommodation in Army Areas.

Huts.

Table A.

Class of Accommodation.	Personnel.	Floor Space.	Remarks.
		Sq. ft.	
Sleeping ...	Field Officer ...	100	In cubicles.
	Junior Officer ...	72	In dormitories.
	Warrant Officer	72	In dormitories.
	N.C.Os. and men	21	Wall space, 2 ft. 6 in.
Ablution sheds	N.C.Os. and men	1	With basins for 12 per cent. strength.
Latrines ...	N.C.Os.	—	8 per cent. of strength.
Latrines ...	Men	—	4 per cent. of strength.

Table B.

Type.	Floor. Dimensions.	Class of Accommodation.	Suitable for Accommodating.
Bell tent with boarded floor	Circular ...	Sleeping ...	2 Officers or W.Os.; 10 N.C.Os. and men.
Marquees ...	31 ft. by 16 ft. ...	Sleeping ...	24 N.C.Os. and men.
Store tents ...	50 ft. by 20 ft. ...	Sleeping ...	40 N.C.Os. and men.
"Armstrong" hut tents	16 ft. by 7 ft. ...	Sleeping ...	1 Field Officer or 2 Junior Officers or W.Os.
"Nissen" small Hut	27 ft. by 16 ft. ...	Sleeping ...	4 Field Officers in cubicles; 6 Junior Officers or W.Os. in dormitory; 20 N.C.Os. and men.
		Accessories	Mess for 10 Officers (kitchen and store detached); mess for 20 serjeants (kitchen detached).

Digitized by Google

Table B—continued.

Type.	Floor. Dimensions.	Class of Accommodation.	Suitable for Accommodating.
"Nissen" Hut (hospital)	60 ft. by 20 ft. ...	—	Mess and ante-room for 25 Officers (kitchen detached).
"Adrian" Hut	98 ft. by 27 ft. ...	Sleeping ...	120 N.C.Os. and men.
"Tarrant" Mk. I Hut	60 ft. by 20 ft. ...	Accessories	Mess for 30–40 Officers (kitchen detached).
		Sleeping ...	55 N.C.Os. and men.
"Tarrant" Mk. II Somerville	60 ft. by 16 ft. ...	Accessories	Mess for 20–30 Officers (kitchen and store detached).
		Sleeping ...	40–55 N.C.Os. and men.
"Dechets" Hut	60 ft. by 16 ft....	Offices, etc.	
		Accessories	Mess for 40–50 serjeants.

A heavy tender will take one "Nissen" small hut.

SIZES AND CAPACITIES.

Aeroplane Tents.

	Weight.	On 1 Lorry.	
B.E. light portable	12 cwt.	3	Will not take R.E. 8, F.E. 2 B, A.W. or H.P.
R.E. 7 light portable	16 cwt.	3	All machines except H.P. Takes 3 Camels, or 2 Dolphins or 3 SE 5's.
R.A.F. heavy portable	$2\frac{3}{4}$ tons	1	Ditto ditto.

Bessonneau Hangars.

Bessonneau hangars are made in four sizes :—

	Weight.
20 by 20 metres	—
20 by 24 metres	$9\frac{1}{2}$ tons (English), $8\frac{1}{2}$ tons (French).
20 by 28 metres	$9\frac{1}{2}$ tons.
26 by 28 metres	35 tons.

Digitized by Google

The latter are known as super-Bessonneaux.

The 20 by 24 metre size is the most common, and all English Bessonneaux are this size.

Capacity of 20 by 24 metre Bessonneaux.

Armstrong-Whitworth	4
Bristol Fighter	6
D.H. 4	4
F.E.	3 (4 in emergency).
R.E. 8	5
S.E. 5	—

An English Bessonneaux requires the following transport :—

For short journeys—

5 lorries (1 with hoops taken off).

For long journeys—

6 lorries (1 with hoops taken off), or 4 lorries with trailers.
2 railway trucks, not less than 33 feet long.

Spare canvas—

A lorry will take a complete set of canvas.
A tender will take curtains and back, but not roof or walls.

One super-Bessonneaux requires 18 lorries, or 11 lorries with trailers, or 7 railway trucks.

Nestler Hangar.

Clear inside measurement	44 by 66 feet.
Weight	7 tons.
Capacity—	
D.H. 4	2
F.E. 2 B	2
Handley-Page	1
Requires following transport—	
(*a*) By road	6 lorries, or 4 lorries and 2 trailers.
(*b*) By rail	2 trucks.

Hervieu Hangar.

Clear inside measurement	80 by 80 feet.
Capacity—	
D.H. 4	5
F.E. 2 B	5
Handley-Page	2

Digitized by Google

Permanent Aeroplane Sheds.

Type "A" aeroplane shed consists of two bays each measuring 52 feet wide by 46 feet deep.

Curtains are each 30 by 16 feet.

Capacity.

Armstrong-Whitworth	2 per bay.
D.H. 4	2 per bay.
F.E. 2 B	1 per bay.
R.E. 8	2 per bay.

Type "B" aeroplane shed measures 60 feet wide by 75 feet deep. Curtains are each 34 by 17 feet.

Capacity.

Armstrong-Whitworth	4
Bristol Fighter	6
D.H. 4	4
F.E. 2	3
R.E. 8	4

On Camouflaging.

This may be done best in one of the following ways :—

Bessonneau hangars.—

(*a*) By means of coloured "scrim," which completely covers the roof.

Sizes of "scrims" are :—

For 20 by 24 metre Bessonneau .... —	2 sheets, each 100 by 42 feet.
For 20 by 28 metre Bessonneau	2 sheets, each 100 by 48 feet.

The sheets must be well secured everywhere or else the first gale will demolish the lot. It is important to secure the sheets at each gable end and round the curve of the roof. In addition several ropes should be taken right over the roof, crossing each other and secured to pickets.

(*b*) By coating with tent varnish (T.V. 4), which is issued in a variety of colours, all of which are used in patches over roofs and sides.

T.V. 4 is also a waterproofing compound.

Permanent sheds.—These can be similarly painted with various coloured paint, obtained from Ordnance, or tarred and covered with sand while the tar is fresh. This latter method gives excellent results. Tar used *without sand* gives a strong reflection in moonlight.

Digitized by Google

Bell tents and marquees.—Treated by "cutch" solution. The method of applying is as follows:—

(*a*) Dissolve 2 lbs. of cutch in 10 gallons of water and boil until practically all dissolved. Transfer at once to an earthenware, wooden, tinned iron or enamelled iron vessel and add ½ lb. of sulphate of copper which has previously been dissolved in the minimum quantity of water necessary for solution.

An iron or galvanised vessel must not be used after addition of the copper solution and some form of wooden vessel is more suitable than any metal or galvanised metal one. The wooden vessel should be provided locally whenever possible. Any vessel can be used for dissolving the cutch alone.

(*b*) Dissolve ½ lb. of bi-chromate of potash in 5 gallons of water and stir well to dissolve. Any convenient vessel will serve for this purpose as the solution need not be heated.

Strike the tent and wet it and apply the mixture (*a*) with a brush.

When the tent is thoroughly dry, apply solution (*b*) with a brush; (*b*) makes the dye a permanent one.

Supplies of cutch, copper sulphate and bi-chromate of potash can be obtained on indent as necessary through Ordnance Officers of Formations.

Aeroplane Light Tents.

Care and Maintenance.

1. Every effort must be made to keep the canvas in good order and to repair small damage immediately it occurs.

If a tear in the canvas is not dealt with at once it rapidly spreads and necessitates a large amount of work being spent on it or even scrapping the canvas altogether.

2. The utmost care must be taken by units to see that canvas not actually in use is stored in a dry place, and is placed on pieces of wood well clear of the ground, and with an air space underneath.

3. All canvas thus stored must be periodically examined to see that it is in no way deteriroating, and once a month opened out to air on a fine day.

Without this care canvas speedily becomes mildewed and unserviceable.

Digitized by Google

Bessonneau Hangars.

Care and Maintenance.

1. Squadrons are responsible for the upkeep of the Bessonneau which they occupy.

2. Bessonneau sheds will stand very high winds providing they are properly looked after and kept in good condition.

The two chief possibilities of Bessonneau being blown down are :—

(*a*) The doors being blown open, thus allowing the wind to get inside the sheds and lift them bodily up.

(*b*) The canvas breaking loose, flapping against the woodwork and breaking the rafters.

3. As regards the door curtains, these must be kept closed as much as possible in windy weather. Whenever shut, they must be properly secured, *i.e.*, the horizontal cross ropes and the front guy ropes must be fastened, and the straps joining the two curtains in the centre must be done up.

Curtains will give less trouble and last longer if they are fastened down with a wire cable running along the front of the hangar stretched from the 111 T. post to the 112 T. post, and fastened to the curtains with Ds or metal rings, level with the ground. This is an addition which can be easily made.

Particular points to look to in the maintenance of door curtains are :—

(*a*) Renewing the straps for fastening the two curtains together in the centre.

(*b*) Renewing the horizontal ropes and front guy ropes, and tightening up the former occasionally.

(*c*) Ensuring that the curtain runners are properly secured to the top of the curtains.

4. As regards the canvas, this is secured to the framework by canvas straps or by cords. These require renewing from time to time.

5. After a high wind, sheds should be carefully inspected for the following :—

(*a*) Rents and tears in the canvas. These must be repaired as soon as they appear.

(*b*) Broken rafters. Broken rafters should be taken away and replaced as soon as possible, otherwise they will tear the canvas.

(*c*) Nuts on the bolts securing the framework may work loose and require tightening.

Digitized by Google

(*d*) All straps and fastenings securing the canvas to the framework. Any that have pulled out must be replaced.

6. The front guy ropes have to be undone when getting machines out of the sheds, but these must always be fastened up whenever the doors are closed.

Both front and rear wire guys require tightening up occasionally.

Snow must not be allowed to accumulate on the roofs, as the weight will break the framework. Not more than four men should be employed at one time in clearing the snow.

Tent varnish should be used to preserve the roof and render it more waterproof, and can be obtained in various colours for camouflaging at the same time. 30 to 35 gallons are required for each roof.

7. The following precautions will also be taken to protect Bessonneau :—

(*a*) In high winds lorries should be drawn up on the windward side to provide a screen.

(*b*) All ropes that pass over the roof to hold down the canvas should be fixed to the ground by screw pickets, and not attached to the side buttresses.

(*c*) The pickets to which the front and rear wire guy ropes are attached must be carefully watched, and if there is any sign of them yielding they should be replaced and a more secure method of holding down the guys arranged ; *e.g.*, tw oor more 4-feet 6-inch pickets.

8. In very exposed positions the following additional precautions should be taken :—

(*a*) Extra guy ropes fixed to the point of crossing of the laths which brace each bay in the back and sides of the hangar, the object of this being to stay the laths outwards, so as to form an additional point of support. This is only necessary in the case of French Bessonneau.

(*b*) A screen erected on the windward side. This can be made of wire netting, or old aeroplane wings bolted on a stout framework.

(*c*) Wire netting may also be placed between the canvas and the framework of the most exposed sides or backs of the hangars.

(*d*) A set of diagonal roof ropes with 5-feet screw pickets should be fitted to any Bessonneau in an exposed situation.

Digitized by Google

9. The above notes also apply to Matrat hangars with the exception that it is unnecessary to secure the roof ropes to a separate screw picket, they could be tied to the buttresses and there are no front or rear wire guy ropes.

Spares.

Spare canvas for Bessonneau sheds will be asked for under the following nomenclature :—

Roof.
Back.
Sides.
Door curtains.
Front upper sheet.

The last is the canvas that fits on between the door curtains and the roof.

When indenting for spares it should be noted that :—

(*a*) Right and left-hand are taken looking into the hangar.

(*b*) Laths and boards are all stencilled with part No., and it is only necessary to quote this to obtain a spare.

Note.—A coil of spare rope should be kept in each hangar for emergencies only.

Be prepared beforehand for gales.

Digitized by Google

Digitized by Google

Digitized by Google

SECTION V.

SALVING OF WRECKED MACHINES.

The following suggestions indicate the best method of dealing with the wreck in order to transport it to the Depôt without further damage.

Too much emphasis cannot be laid on the question of well-padding the fuselage.

A kit of tools, rope, &c., should always be kept ready for dealing with crashes

General Principles.

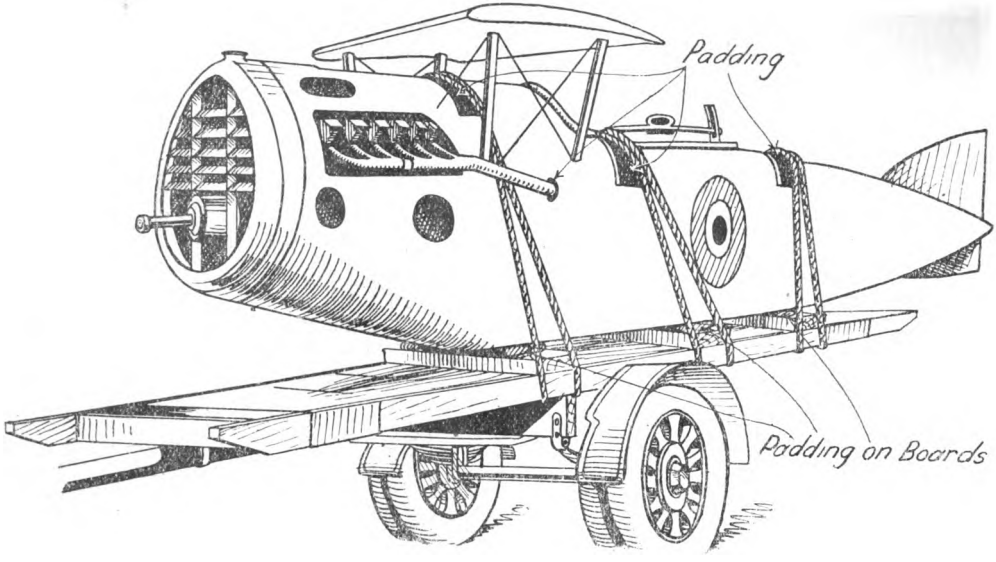
Whilst the general principles of salving wrecked machines remain constant, the actual methods employed in each case will depend much on circumstances, and the following notes are only intended as a general guide.

A breakdown party sent to fetch in an ordinary wrecked machine generally consists of five A.Ms. and the driver, additional help being obtained locally, if required.

A two-wheeled flat trailer is taken to bring in the fuselage or nacelle, unless too badly crashed, drawn by a tender if the machine to be salved is a light scout, or, if a two-seater, by a lorry to carry the planes, struts, wires, &c.

The tackle required for the party should include:—A set of 16-feet shear legs with 15-cwt. block and tackle. A stool kit containing:—2 hammers (1 lb. and 1½ lb.), 3 adjusting spanners 3 quickgrips (2 small and 1 large), 2 flatnose pliers (1 small and 1 large), 2 Bernard pliers, 1 wire-cutter, 1 cold chisel, 1 tommy bar, 2 screwdrivers, 1 punch, 1 file, 1 hacksaw, and 1 handsaw. The latter is useful for cutting away fences if necessary. Plenty of rope. Padded packing pieces for putting under the fuselage or nacelle. Felt padding, waterproof covers for engine and machine. Portable electric light set. Petrol tins for emptying the tanks. A few pieces of timber about 4 feet by 3 inches by 3 inches will also often be useful.

Digitized by Google



BRISTOL FIGHTER ON TRAILER, SHOWING PADDING UNDER FUSELAGE AND ROPES.

Digitized by Google

On arriving at the machine, assuming it to be a medium-sized tractor with damaged undercarriage :—

Remove the watch, empty tanks and radiator and see that the guns are not loaded.

Then carefully dismantle the planes, &c., and bundle all struts and wires, all woodwork being fully protected with felt padding under the ropes.

Set up the shear legs over the engine. On hard ground fix a rope round the feet of the shear legs to prevent them spreading, the rope being fixed under cleats nailed to the legs, to stop it creeping up.

Next raise the engine and front of the fuselage by the block and tackle and remove the damaged undercarriage. Then raise the tail of the machine and run the trailer under the fuselage.

Then lower the fuselage on to the trailer to rest on *well-padded* packing pieces placed at the points of support under the vertical fuselage struts. This padding must only come under the vertical struts and not be continuous across the fuselage, otherwise the horizontal struts resting on it will be strained.

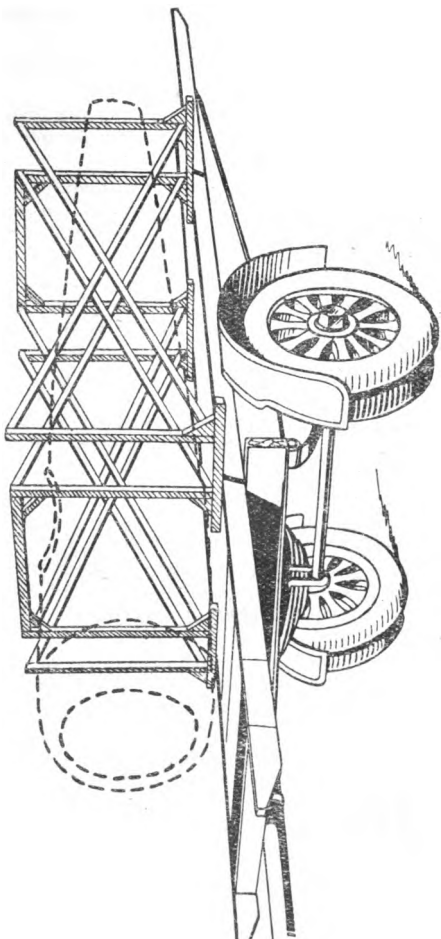
The fuselage is then securely roped to the trailer, felt padding being put under all ropes where they cross longerons and all other parts of the machine liable to be damaged by them.

All exhaust manifolds and other openings whereby dust can find its way into the engine must be plugged and the engine covered with a waterproof cover and preferably the whole fuselage.

The planes will then be packed on to the lorry, the large ones on the side brackets, which must be well padded and padding put under the ropes pressing over the trailing edges, &c. Wheels, small planes and sundries go inside the lorry.

A pusher or scout would be dealt with in much the same way, except that in the case of the latter it would often be possible to pack the whole machinery on to the trailer, the planes being secured on each side of the fuselage.

Digitized by Google



SKETCH OF SCOUT CARRIER.

Digitized by Google

A neat plane carrier for this purpose to be fixed to the trailer is shown in the sketch. This carrier enables two small main planes to be safely carried on each side of the fuselage and the tail planes over, and should prove very useful for most light scouts.

The use of padding has been emphasised in these notes, and too much attention cannot be paid to its proper use. Numerous cases have occurred where more damage has been done to the machine by bad packing than by the actual crash, serviceable longerons, booms, &c., being often made quite useless by the chafing of the ropes.

Loading all machines on trailers instead of into lorries also often saves damage to the bottom of the machine and saves time in loading and unloading.

Some machines require special packing. For S.P.A.Ds., when the undercarriage is removed, a special cradle should be provided to fit the underside of the fuselage to avoid damage to the segmental-shaped bottom tank.

S.E. 5's, without undercarriages, require blocking up when on the ground, as otherwise the trailing edges of the bottom centre section planes which project below the underside of the fuselage will be strained or broken by the weight of the machine.

Many crashed machines can be brought in on their own undercarriages, which, if slightly crippled, can often be braced with timber splints, new wheels being fitted if necessary, for which purpose spare wheels should be carried if likely to be required.

When a machine has turned completely over, it is often best to turn it back before dismantling.

This can generally be done by fixing a stout rope to the tail, by which to pull it over, and two guide ropes to steady its descent.

For local crashes on or near the Aerodrome, a six-wheeled trolley will be found most useful. It should have a strongly-constructed deck about 8 feet by 4½ feet. The middle pair of wheels, 750 mm. by 125 mm., to be arranged to project 3 inches lower than the 700 mm. by 100 mm. pairs of wheels at each end.

Such a trolley can be run across small ditches, &c., and on it a machine which has damaged its undercarriage can be brought in without being dismantled when it is necessary to clear the aerodrome quickly.

Digitized by Google

Digitized by Google

Digitized by Google

SECTION VI.

GENERAL INFORMATION.

Army Books and Forms.

A.B.	8	.... F.S. Vouchers.
,,	43	.... Requisition and I.V. for Expendable Stores.
,,	55A	.... Indent for Rations.
,,	108	.... Temporary Issue and Receipt Voucher.
,,	136	.... Note Book (pocket size).
,,	152	.... F.S. Correspondence (Octavo size).
,,	153	.... F.S. Note Book (pocket size).
,,	158	.... Convoy Note.
A.F.	A. 2042	.... F.S. Postcard.
,,	B. 122	.... F.S. Conduct Sheets.
,,	B. 252	.... Charge Sheet.
,,	B. 2069	.... Offence Report.
,,	C. 348	.... Small Memo.
,,	C. 348	.... Large Memo.
,,	C. 398	.... F.S. Envelope.
,,	C. 2121	.... Message Pads.
,,	G. 983	.... Ordnance Voucher.
,,	G. 987	.... Stocktaking Report.
,,	G. 994	.... F.S. Indents.
,,	G. 997	.... Peace Indent.
,,	G. 1028	.... Packing Note.
,,	G. 1033	.... Issue and Receipt Voucher.
,,	G. 1045	.... Workshop Repair Indent.
,,	G. 1049	.... Transfer Voucher.
,,	G. 1063	.... Hastener.
,,	G. 1096	.... Schedule detailing components of Aeroplane or Engine.
,,	G. 1098	.... List of Spares authorised to be held by Unit.
,,	K. 1282	.... Fire—Precautions against (poster).
,,	K. 2418	.... Tally Card.
,,	K. 2419	.... Index Card.
,,	N. 1513	.... Acquittance Roll (all arms).
,,	O. 1796	.... Allotments on and off strength.
,,	W.3039	.... Movement Orders.
,,	W.3069	.... Charges Issues on Payment to Men.
,,	W.3015	.... Leave Pass.
,,	W.3225	.... Issues on Payment to Officers.
,,	W.3321	.... Clothes Statement.
,,	R.F.C. 336	Recommendation for Promotion.

Digitized by Google

ESTABLISHMENTS.

	Squadron.			Balloon Wing.	Balloon Company.	Balloon Section.	Aircraft Park.	Aircraft Depôts.			Aeroplane Supply Depôt.			Port Depôt per Unit.	Reserve Lorry Park.	Remarks.
	Single-seater	Two-seater	Corps.					1st Unit.	Subsequent Units.	Reserve per Unit.	Headquarters.	Reception Park.	Repair Park.	Issue Section.		
	Army.	Army.														
PERSONNEL.																
Officers ...	24	37	43	3	3	4	6	19	8	—	5	42	40	10	1	*Squadron.*—
Rank and file	160	179	207	14	21	102	145	554	345	—	23	330	1,695	210	81	Armourers for—
																1 Lewis gun ... 4 A.Ms.
																1 Vickers gun 6 ,,
																2 Lewis guns 5 ,,
																2 Vickers guns 9 ,,
TRANSPORT.																1 Lewis and 1
Cars, closed ...	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	Vickers gun 8 ,,
Cars, open ...	1	1	1	1	—	1	2	—	—	12	2	1	1	—	—	
Light tenders...	5	5	9	1	2	2	4	10	3		1	10	6	2	1	*Balloon Wing* is composed of 4 companies each of 2 sections.
3-ton *Heavy Tenders*—																
Aviation ...	7	7	7	1	—	3	8	8	4	6	1	6	20	3	3	30
Workshop 6	2	2	2	—	1	—	1	1	—	—	—	—	—	2	—	1
Instrument repairing	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	*Aircraft Parks* have also a Reserve Establishment of 4 light tenders and 8 motor cycles.
Winch ...	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	
Crocodile float	—	—	—	—	—	—	—	2	1	1	—	—	4	—	3	—

Digitized by Google

	Squadron.			Balloon Wing.	Balloon Company.	Balloon Section.	Aircraft Park.	Aircraft Depôts.			Aeroplane Supply Depôt.				Port Depôt per Unit.	Reserve Lorry Park.	Remarks.
	Single-seater Army.	Two-seater Army.	Corps.					1st Unit.	Subsequent Units.	Reserve per Unit.	Headquarters.	Reception Park.	Repair Park.	Issue Section.			
'Phone ...	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	*Aircraft Depots.*—1 unit of Stores, Accounting—Sub and M.T. Sections to supply 10 squadrons. 1 unit of Gas Plant Section to supply 400 tubes per day. 1 Hydrogen Dump Party per Army.
Ammunition column	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Trailers—																	
Flat... ...	6	6	6	—	—	—	2	6	—	—	—	4	4	1	—	24	
Wing ...	1	1	1	—	—	—	4	4	—	—	—	2	4	—	—	—	
Water ...	1	1	1	—	—	1	1	—	—	—	—	—	—	1	—	—	
Crocodile ...	—	—	—	—	—	—	—	2	—	—	—	—	4	—	3	—	
Motor cycles	8	8	13	2	2	3	2	6	3	24	4	6	6	2	2	1	
Side cars ...	4	4	4	1	1	2	1	—	—	—	2	4	4	1	1	1	

Digitized by Google

Fire Precautions.

Fire extinguishers should be fixed in convenient positions, kept ready for use at a moment's notice, and their position marked by a conspicuous sign.

Buckets of dry sand should also be kept ready.

Fire extinguishers are apt to freeze in cold weather and be rendered useless. This can to a large extent be prevented by :—

(*a*) Fixing extinguishers in the most sheltered positions, or, if necessary, by arranging a fire post near some fire during the winter.

(*b*) Felt jackets can readily be made to cover the extinguishers, which will largely overcome the difficulty.

Mechanics must be instructed *not* to bang the knob of the extinguisher until they reach the scene of the fire.

Fire buckets in frosty weather should be placed, as far as possible, inside the buildings they serve. They must be regularly inspected, ice broken and buckets refilled, when necessary.

A group of buckets, covered with a tarpaulin or canvas in frosty weather, and a space in the centre for Field Service lamps, is very effective.

Extract from General Routine Order No. 1733.

Attention is drawn to the following General Routine Order No. 1733, dated 12th August, 1916 :—

"Chemical fire extinguishers and all first-aid appliances will be examined daily.

"Where large numbers of chemical extinguishers are installed, one at least will be blown off monthly, and all once every six months.

"Refills should be demanded through the usual channel, the name of the manufacturer of the extinguisher being quoted on the indent."

It follows that all chemical extinguishers should be blown off and refilled every six months. It is best that this should be done gradually, one-sixth being blown off every month. In order that extinguishers should not be blown off just after being refilled, it is suggested that they should all be numbered consecutively and certain numbers selected each month. A record of when each extinguisher is blown off should be kept in a book for the purpose. No extinguisher should be blown off until a refill has been procured.

Extinguishers which are pump-operated do not require periodical renewal, but they should be examined every day.

Digitized by Google

Extract from General Routine Order No. 2717.

The following orders will be read out on parade once a month, and will be posted up in prominent positions in billets, huts, tents, &c.

(1) Fires, stoves, braziers, naked lights and smoking are forbidden in any room or barn which contains hay, straw or other inflammable.

(2) Where stoves and braziers are allowed in billets or huts, they must be placed on sheet-iron or an earth or brick floor, and definite precautions must be taken to prevent ashes or bits of burning coal from falling out of the stove or brazier.

(3) No open lighted brazier or naked light is to be left unattended in any hut or billet.

(4) Cookhouses, field cookers, forges and incinerators, will not be placed against the walls of any buildings, or in the vicinity of ricks or stacks of inflammable material. Their precise position will be fixed by an officer.

(5) Tent lanterns, when available, will always be used in billets, huts or tents; when these are not available and candles are used, they must be fixed in an empty tin to protect them on three sides and top and bottom, and placed as far as possible from any canvas or tarred material in the billet.

(6) Petrol must not be used in any cooking or heating stove. Petrol, paraffin, oil and candles must not be stored near any stove, brazier, fireplace or lamp.

(7) Buckets or tins containing water, sand or dry earth, will be kept ready to hand in every billet or hut or tent for use in case of fire.

(8) The greatest care must be used in throwing away matches or cigarette ends, knocking out pipes or handling lighted candles. It is the duty of every man to realise the danger to life and property by carelessness in such matters.

The above precautions are only those intended to be of general application. Other precautions may be called for according to the various localities. For instance, in cases where it is necessary to heat billets which have thatched roofs, or are wholly or partly lined with canvas or tarred felt, care must be taken that the heating arrangements are such as to obviate risk of fire. It is

Digitized by Google

the duty of all officers concerned to see that all necessary precautions against fire are properly carried out. With regard to the issue of lanterns and hurricane lamps, attention is drawn to G.R.O. No. 1731, as amended by G.R.O. No. 1741.

Officers will be specially responsible for seeing that there is no indiscriminate lighting of fires likely to prove dangerous. This practice has proved a fertile source of danger in the past, and the following precautions will be observed :—

(1) No stoves will be brought into use in any hut or billet unless it has been inspected and pronounced safe by an officer. It will be at least 3 feet clear of the wall and a clearance of not less than 1 inch should be left all round the stove-piping where it passes through a wooden wall or roof. The latter will be suitably protected by a metal covering round the hole through which the piping passes. Flues must be regularly swept.

(2) When a unit occupies a billet with a fireplace which is of defective construction and likely to prove dangerous, the O.C. unit will arrange for its use as a fireplace to be rendered impossible.

(3) No braziers or fires of any kind will be permitted in, or hanging from the outside, of railway vehicles used by troops when travelling.

Attention is called to the financial liability which may be incurred by an officer under Section 137 of the Air Force Act for any loss, damage or destruction of public property caused by negligence on his part.

Such negligence may be either in not taking proper steps to promulgate fire orders to the unit under his command, or in not ensuring by adequate inspection and supervision that such fire orders are being obeyed.

The Air Council has, in several cases, recently directed Commanding Officers to pay sums up to £50 towards the cost of damage by fires which occurred in buildings occupied by their units. Attention is further called to the fact that in the case of Officers' Messes, a personal liability towards the owner is incurred by officers composing the Mess, where damage to buildings is caused by fire which occurs through neglect of ordinary precautions.

Digitized by Google

The procedure laid down in circular letter SS. 499, dated 10th October, 1917, will be strictly followed in all cases in which fires have occurred.

G.R.O's. Nos. 1295, 1345, 1373, 1436, 1535, 2097 and 2318 are hereby cancelled.

INSIGNIA OF OFFICERS OF THE UNITED STATES ARMY.

Officers of the United States Army are distinguished :—

(1) By the single band of braid worn on both cuffs of tunic, same for all ranks.

(2) By the block letters " U.S." or " U.S.R." worn on both sides of the collar of tunic, same for all ranks; the U.S. signifies that the officer is a member of the Regular Army; the U.S.R. that the wearer is a member of the Officer Reserve Corps.

(3) By the insignia, given below, worn on both shoulders of the tunic which differs with the rank as shown.

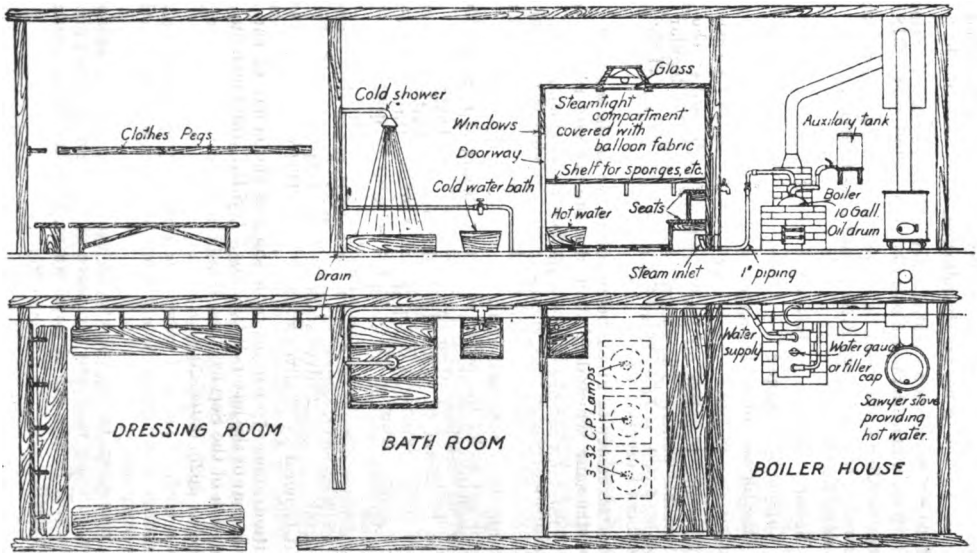
(4) By the kind of cord worn on the service hat, which also differs with the rank as shown.

Rank.	Shoulder Ornament.	Hat Cord.
Second Lieutenant	None	Gold and black.
First Lieutenant	1 silver bar	Ditto.
Captain	2 silver bars	Ditto.
Major	Gold oak leaf	Ditto.
Lieutenant-Colonel	Silver oak leaf	Ditto.
Colonel	Silver spread eagle	Ditto.
Brigadier-General	1 silver star	Gold.
Major-General	2 silver stars	Ditto.
Lieutenant-General	3 silver stars	Ditto.

In addition, officers wear on both sides of the collar of the tunic, to the rear of the letters " U.S." or " U.S.R.," their insignia of their branch of the Service.

(G.R.O. No. 2625, dated 20.9.17.)

Digitized by Google



PLAN OF VAPOUR BATHS.

Digitized by Google

Vapour Bath.

Notes on Construction.

The illustration shows an installation which has been working successfully for a considerable time.

A much smaller installation is sufficient for a Squadron, and can be constructed with very little labour and material.

The essentials are :—

(1) Boiler.

(2) Vapour bath proper.

(3) Cold shower or cold sponge.

(4) Dressing room.

A good, sound 10-gallon oil drum, with the vent sealed, makes a very suitable boiler. The steam vent is through a ¾-inch or 1-inch pipe, ¾-inch is best, from the drum direct into the bath chamber.

It is not necessary to fit an intermediate tap as shown.

In constructing the boiler, allow the cement and mortar to dry naturally. Four days is usually sufficient for this.

The additional water tank shown in the drawing is not absolutely necessary, but if not fitted the boiler will have to be filled by hand regularly each half-hour.

In order not to let the boiler run dry of water, it is advisable to fit a simple cork float gauge to register the water level.

Do not be afraid to stoke the boiler fire well. There is no danger of boiler explosion if the ¾-inch vent is free. In actual use, a 10-gallon drum is quite serviceable up to nine months' constant use.

In the construction of the vapour bath itself, it has been found best to construct this with a double wall of unserviceable kite balloon fabric, if obtainable, with an air space between the two layers, excluding all draughts which naturally cause condensation of the steam. If fabric is not obtainable, old 4-gallon tins opened out and fastened together form a good substitute. For emergency purposes two windows should be fitted which it is only necessary to push, if required.

From a medical point of view, it is absolutely necessary that a cold sponge down immediately upon leaving the steam bath is made compulsory.

It is necessary to use plenty of soap when in the steam chamber, rubbing well into the pores of the skin and sponging off afterwards from a tub of warm water, provided in the steam chamber itself.

Digitized by Google

Weather.

Barometer Indications.

Local indications which assist in a forecast are the behaviour of the barometer and thermometer, and the aspect of the sky and clouds.

Barometer.

Rapid rise	Unsettled weather, liability to sudden changes.
Gradual rise	With a dry atmosphere, fair weather. After southerly winds, improving tendency with wind from W. or N.W.
Rise after being low	First rising usually precedes heavy winds from the northward, continued rising indicates improving weather.
Rise after being normal	With falling temperature and dry atmosphere, wind from N.E., N. or N.W., or less wind.
Steadiness	With dry atmosphere, fine weather.
Rapid fall	Stormy weather and rain. If with westerly wind, storms from southward.
Considerable fall	High wind, rain or snow ; wind from N. if thermometer is low, from S. if it is high.
Fall after being normal	With rising thermometer and increasing dampness, wind from S.E., S. or S.W. If thermometer is low, snow.
Fall	After northerly winds, bad tendency, wind probably shifting to S. With high or increasing temperature, winds from S. or S.W., possible rain.

The barometer generally falls with a S. and rises with a N. wind ; if the opposite happens the S. wind will be dry and the weather fine, or the N. wind will be strong and will bring rain. Fine weather with a low barometer is usually followed by a duration of wind or rain.

Clouds.

Cirrus	Consists of flexuous fibres extending in any direction. Marestail clouds usually indicate coming wind. Average altitude, 30,000 feet.

Digitized by Google

Cirro-stratus	A flat, widely extended cloud. A "mackerel" sky is an example. Sign of rain or snow.
Cirro-cumulus	Small, well-defined rounded masses in close horizontal arrangement. A forerunner of storms.
Cumulo-stratus....	A mixture of the cirro-stratus and the cumulus; may turn to nimbus, but often evaporates.
Nimbus	Usually formed from cumulo-stratus; a dense black cloud with ragged edges, from which rain is falling.
Cumulus	Convex, or conical heaps rising from horizontal base, showery when large and piled up; when very large and ragged at the top, cause local thunderstorms.
Stratus	A widely extended, horizontal cloud, which increases from below. Includes some mists and fogs. Average height, 1,500 feet.

Cirrus and cirro-stratus clouds, whose altitude above sea level averages about 5 miles, consist of minute crystals of ice; all other clouds are composed of fine particles of water.

Neither crystals nor drops actually float in the air. They are constantly falling with respect to the air around them, though, as the air itself often has an upward movement, the cloud particles are not always falling with reference to the earth. This fact is of considerable interest to aviators, and those interested in soaring flight.

A fog is a cloud lying at the earth's surface.

In general, soft-looking clouds accompany fine weather, and those with clear and well-defined edges precede wind. Ragged clouds and light scud are the forerunners of strong wind and rain.

Colour of Sky, &c.

Red at sunset	Fair weather.
Red at dawn....	Bad weather, or wind.
Grey at dawn	Fair weather.
Bright weather at sunset	Wind.
Pale yellow at sunset	Rain.

A high dawn (first light behind bank of clouds) foretells wind, and an unusual clearness of the atmosphere near the horizon is a very sure sign of rain.

Digitized by Google

Digitized by Google

Digitized by Google

SECTION VII.

MISCELLANEOUS DATA.

French Railway Trucks and Capacities.

O/G = Open goods.

Name.	Length.	Breadth.	Type.	Capacity.
	Ft. in.	Ft. in.		
"Plus Grand"	63 6	9 0	O./G.	2 Aero cases, any size.
S.S.Y. ...	49 0	9 0	O./G.	2 Aero cases, R.E. 8, A.W. or Sopwith.
E.	34 9	8 10	O./G.	1 Aero case, any type, SPAD plane crates.
K.K.T. ...	32 6	9 2	O./G.	1 Aero case, any type, SPAD plane crates.
K.L.	28 6	9 2	O./G.	1 Aero case up to R.E. 8.
M.	28 0	9 2	O./G.	1 Aero case up to R.E. 8. This type is rare
K.K.	25 0	9 0	O./G.	All small Aero cases up to D.H., usual type for M.T. vehicles. Will take 2 plane crates, except SPAD type.
X.L.P.* ...	21 6	9 0	O./G.	Small Aero cases up to Sopwith. M.T. vehicles and miscellaneous. Two of these trucks required for 1 Bessonneau.
V.Z.Z. ...	20 0 and 15 0	9 0 (Depth, 4 0)	O./G.	Coal wagons—side and end doors. Some with hopper bottoms.
High-sided ...	25 0	7 3	O./G.	With 4-in. sides } Scrap timber and road material.
High-sided ...	16 9	7 3	O./G.	With 3-in. sides } Scrap timber and road material.

* Most commonly used.

Digitized by Google

Name.	Length.	Breadth.	Type.	Capacity.
	Ft. in.	Ft. in.		
H. 10-ton ...	25 0, 20 0 and 15 0	9 0	Covered	Depth, 7 ft. 6 in.
H. 20-ton ...	25 0	9 0	Covered	
W.D. 20-ton...	27 0 and 25 0	9 0	Covered	
				10-ton wagons will take :— 230-lb. bombs ... 50. Or 112-lb. bombs 76. Or Cooper bombs 1,176. Other than Rolls Royce, 7 engines in cases; 5 Rolls Royce in case. Or 250 cases=2,200 gallons Petrol. 20-ton wagon will take :— 230-lb. bombs ... 70. Or 112-lb. bombs 96. Or Cooper bombs 1,440. Or 340 cases=2,720 gallons Petrol.

Vehicles and Capacities.

G.S. Wagon.

Petrol (in cases) .... 240 gallons.
Oil (in cases) .... 24 ,,

G.S. Limbered Wagon.

Petrol (in cases) .... 96 gallons.
Oil (in cases) .... 8 ,,

Light Tender.

Engines :—
1 Rotary.
1 Hispano.
1 Beardmore.
Petrol in cases .... 112 gallons.
S.A.A. Ammunition .... 19,000 rounds + 12,000 disintegrating links.
Sandbags (in original bales) 3,000

Note.—Maximum load for light tender is 15 cwt.

Digitized by Google

3-ton Leyland Lorry.

Petrol (in tins)	750 gallons.
20-lb. Cooper bombs	176
112-lb. bombs	30
Hydrogen cylinders (English)	25
Nissen hut (2-ton 4-cwt. 3-qrs.)	1
R.A.F. heavy portable shed	1
R.E. 7 light portable tents	3
Rotary engines	3
Hispano engines (180-h.p. or 200-h.p.)	3
140-h.p. R.A.F. engines (in short cases)	3
140-h.p. R.A.F. engines (in long cases)	2
Beardmore engines	2
250-h.p. Fiat engines	2
200-h.p. R.A.F. and 230-h.p. B.H.P. engines	2
275-h.p. Rolls Royce engine (in case)	1
190-h.p. Rolls Royce engine (in case)	1
Sandbags (in original bales)	20,000
Timber 9-inches by 3-inches	500 feet.
Corrugated-iron sheets, 6 feet by 2 feet	300 sheets.
S.A.A. Ammunition	85,000 rounds + 66,000 disintegrating links.

Trailers.

	Maximum Load.
Flat	15 cwts.
Crocodile	55 ,,

MISCELLANEOUS SIZES.

Aero Cases.

	Length.	Width.	Height.
	Ft. in.	Ft. in.	Ft. in.
Armstrong-Whitworth	32 0	8 0	8 6
Bristol Fighter	29 0	8 6	9 0
R.E. 8	27 6	8 0	8 6
B.E.	26 0	8 0	8 6
De Havilland 4	21 6	7 6	8 0
De Havilland 5			
S.P.A.D.			
S.E. 5			
Sopwith Camel	18 6	8 0	8 6
Sopwith Scout			

Digitized by Google

Engine Cases.

	Length.	Width.	Height.	Engine and Case, Gross Weight.
	Ft. in.	Ft. in.	Ft. in.	Cwt. qrs. lbs.
275-h.p. "Eagle" Rolls Royce	7 0	4 0	4 9	15 0 0
190-h.p. "Falcon" Rolls Royce	7 0	3 8	3 9	12 0 0
250-h.p. F.I.A.T.	6 7	2 7	4 5	12 0 0
230-h.p. B.H.P.	6 2	3 5	4 8	9 3 0
200-h.p. R.A.F.	6 5	3 1	4 8	13 0 0
180–200-h.p. Hispano Suiza	5 8	3 10	4 0	7 1 0
160-h.p. Beardmore	6 4	2 10	3 6	9 3 0
140-h.p. R.A.F. ...	6 0	2 8½	4 10	9 3 0
Rotary (short case)	4 0	4 0	3 9	5 0 0

180-h.p. Hispano-Suiza will also fit into a case 4 feet 8 inches long, 3 feet 4 inches wide, 3 feet 6 inches high (90-h.p. R.A.F case).

140-h.p, R.A.F's. are occasionally received in cases 6 feet 4 inches long.

Shipping Tonnage.

1 shipping ton = 40 cubic feet.
" = 175 gallons of petrol or oil in 2-gallon tins and wooden cases,
Or 300 gallons of petrol in bulk.
R.A.F. hangar = 6½ shipping tons.
R.E. tent = 8½ shipping cwts.
Workshop lorry = 54 shipping tons.
Heavy tender = 34 shipping tons.
Lght tender = 13½ shipping tons.

Digitized by Google

Miscellaneous Weights.

Bombs in cases.—	
Cooper 20-lb. bomb	38 lbs.
R.L. 112-lb. bomb	192 ,,
R.L. 230-lb. bomb	336 ,,
Bombs, phosphor, 40-lb. (2 in case)	176 ,,
Michelin parachute flare (without packing case)	25 ,,
Cartridges.—	
Service ·303 (box of 1,152)	78 lbs.
Service ·303 (1,000 bare)	55 ,,
Guns.—	
Lewis gun, Mark I, ground pattern	25 lbs.
Lewis gun, Mark II, aerial pattern	18½ ,,
Maxim, ·303, water-cooled	58 ,,
Maxim, ·450, air-cooled	50 ,,
Case for "Maxim, ·450," without spares	50 ,,
Vickers, air-cooled gun	32½ ,,
Chests, Lewis and Vickers, empty	36 ,,
Single Lewis gun drum, with 47 rounds of ammunition	4½ ,,
Double Lewis gun drum, with 97 rounds of ammunition	8½ ,,
Canvas belt for Vickers gun, with 250 rounds of ammunition	15½ ,,
Mark II link belt for Vickers gun, with 250 rounds of ammunition	17½ ,,
Prideaux link belt for Vickers gun, with 250 rounds of ammunition	18½ ,,
Cameras.—	
"L" type, bare	24 lbs.
"L" type, with release, plunger, propeller, drive, bracket and 3 magazines	33 ,,
"P" type	10½ ,,
"W.A." type	16 ,,
"B" type	20 ,,
"H" type	17½ ,,
Wireless.—	
Sterling transmitter	9 lbs.
C.A.V. accumulator for above	8 ,,
Aeroplane transmission set, complete	27½ ,,
Short wave tuner, Mark III	22 ,,
Wireless receiving station, complete	175 ,,

Digitized by Google

Electrical heating apparatus.—

Generator	11½ lbs.
Generator, bracket	2 ,,
Switch box	1¼ ,,
Wiring	6 ,,
Accumulator, small	7½ ,,
Accumulator, large	13 ,,
1 set of clothing	2½ ,,
Total weight of equipment for two persons, with large accumulator	45 ,,

Oxygen apparatus.—

Old type cylinder—capacity, 450 litres	16½ lbs.
New type cylinder—capacity, 450 litres	6½ ,,
Dreyer regulator	5 ,,
Siebe Gorman Mark II regulator	3½ ,,
Complete set for two persons, with two new type cylinders	20 ,,

Balloons, &c.—

Envelope ("M" type) with rigging attached....	800 lbs.
Basket, with suspension bar	70 ,,
Parachute, in case	22 ,,
Valve	20 ,,
6,000-ft. 6·8 mm. cable	675 ,,
6,000-feet, 5·5 mm. cable	450 ,,

Gas.—

Hydrogen gas cylinder, French, 220 cub. ft.	2 cwts.
Hydrogen gas cylinder, English, 220 cub. ft.	2½ ,,
Oxygen, H.C., French cylinder, cub. ft., full	18½ lbs.
Oxygen, H.C., English, large, cub. ft., full	14½ ,,
Oxygen, H.C., English, small, cub. ft., full	10 ,,

Clothing.—

1 Sidcot suit	8½ lbs.
1 pair thigh boots	7 ,,

"*C.C*" *gear.*—

Type "A"	16¾ lbs.
Type "B"	18 ,,

Digitized by Google

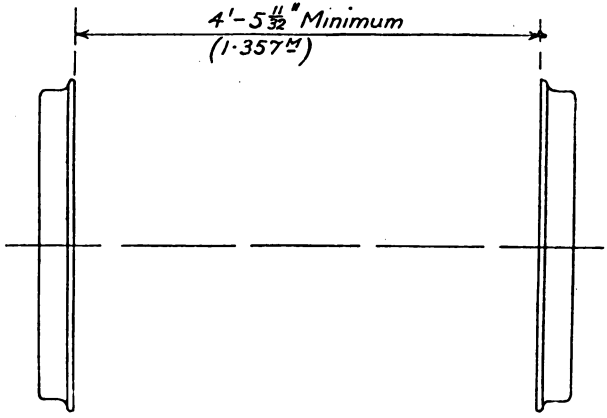
Petrol and oil.—

Tins of petrol, full	18	lbs.
4 tins of petrol in wooden case	94	,,
Tin of oil, full	22	,,
250 gallons of petrol in 2-gallon tins	1	ton.
192 gallons of petrol in 2-gallon tins and wooden cases	1	,,
200 gallons of oil in 2-gallon tins	1	,,
160 gallons of oil in 2-gallon tins and wooden cases	1	,,

Average amount of Lubricating Oil required per 100 gallons of Petrol.

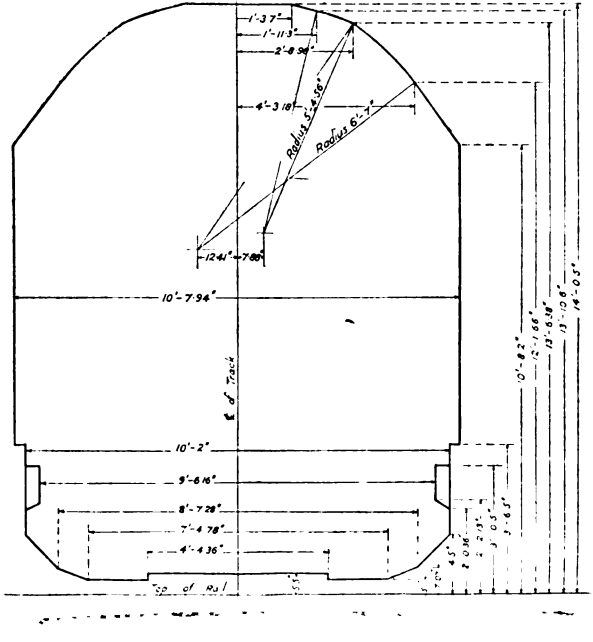
	Gallons.	
R.A.F. engines	10	Vacuum.
Beardmore engines	6	Vacuum.
Rotary engines	20	Castor.
Rolls Royce engines	4	Wakefield's Castrol.
180-h.p. Hispano Suiza, French or English....	6	Castor.
200-h.p. Hispano Suiza, geared French	7	Castor.

A minimum of 550 gallons of aviation petrol is carried in the Squadron transport, with a proportionate amount of lubricating oil.



CLEARANCE DIAGRAM FOR CHEMIN DE FER DU NORD.
Scale ¾" = 1'. (From D.R.T. P.45.).

Digitized by Google



Clearance Diagram
for
Chemin de Fer du Nord.

Digitized by Google

Digitized by Google

Digitized by Google

SECTION VIII.

TABLE OF SIZES A.G.S. BOLTS AND NUTS.

Diameter B.A.	A.G.S. Mark. No.	A.G.S. Mark. Length.	Bolts. A 2-in.	B 4-in.	C 6-in.	D 8-in.	E 1.0-in.	F 1.2-in.	G 1.4-in.	H 1.6-in.	I 1.8-in.	J 2.0-in.	K 2.2-in.	L 2.4-in.	M 2.6-in.	Nuts. Mark.	Ordinary.	Thin.	Lock Nuts, L.H.	Slotted.	Castle.	Diameter.
B.A. 6...	101		*	*	*	*	*	*	*	*	*	*	*	*	—	D	115	—	238	—	—	B.A. 6
B.A. 4...	102		—	*	*	*	*	*	*	*	*	*	*	*	*	C	115	—	238	—	—	B.A. 4
B.A. 2...	103		—	*	*	*	*	*	*	*	*	*	*	*	*	B	115	—	238	114	—	B.A. 2
B.S.F.—																						B.S.F.—
¼-in.	105		—	*	*	*	*	*	*	*	*	*	*	*	*	A	116	117	239	118	119	¼-in.
9/32-in.	106		—	*	*	*	*	*	*	*	*	*	*	*	*	B	116	117	239	118	119	9/32-in.
5/16-in.	107		—	*	*	*	*	*	*	*	*	*	*	*	*	C	116	117	239	118	119	5/16-in.
11/32-in.	108		—	—	*	*	*	*	*	*	*	*	*	*	*	D	116	117	239	118	119	11/32-in.
3/8-in.	109		—	—	*	*	*	*	*	*	*	*	*	*	*	E	116	117	239	118	119	3/8-in.
13/32-in.	110		—	—	—	*	*	*	*	*	*	*	*	*	*	F	116	117	239	118	119	13/32-in.
7/16-in.	111		—	—	—	*	*	*	*	*	*	*	*	*	*	G	116	117	239	118	119	7/16-in.
15/32-in.	—		—	—	—	—	—	—	—	—	—	—	—	—	—	I	—	117	239	—	—	15/32-in.
½-in.	112		—	—	—	*	*	*	*	*	*	*	*	*	*	H	116	117	239	118	119	½-in.

The A.G.S. Nos. of the nuts corresponding are shown in the column under Nuts.

Digitized by Google

TABLE OF SIZES A.G.S. BOLTS AND NUTS—*continued.*

Diameter B.A.	A.G.S. Mark. No.	A.G.S. Mark. Length.	Bolts. N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Nuts. Mark.	Ordinary.	Thin.	Lock Nuts, L.H.	Slotted.	Castle.	Diameter.
			2.8-in.	3.0-in.	3.25-in.	3.5-in.	3.75-in.	4.0-in.	4.25-in.	4.5-in.	4.75-in.	5.0-in.	5.5-in.	6.0-in.	6.5-in.							
B.A. 6...	101		—	—	—	—	—	—	—	—	—	—	—	—	—	D	115	—	238	—	—	B.A. 6
B.A. 4...	102		*	*	—	—	—	—	—	—	—	—	—	—	—	C	115	—	238	—	—	B.A. 4
B.A. 2...	103		*	*	*	*	*	*	*	*	*	*	*	*	—	B	115	—	238	114	—	B.A. 2
B.S.F.—																						B.S.F.—
¼-in.	105		*	*	*	*	*	*	*	*	*	*	*	*	—	A	116	117	239	118	119	¼-in.
9/32-in.	106		*	*	*	*	*	*	*	*	*	*	*	*	—	B	116	117	239	118	119	9/32-in.
5/16-in.	107		*	*	*	*	*	*	*	*	*	*	*	*	—	C	116	117	239	118	119	5/16-in.
11/32-in.	108		*	*	*	*	*	*	*	*	*	*	*	*	—	D	116	117	239	118	119	11/32-in.
3/8-in.	109		*	*	*	*	*	*	*	*	*	*	*	*	—	E	116	117	239	118	119	3/8-in.
13/32-in.	110		*	*	*	*	*	*	*	*	*	*	*	*	—	F	116	117	239	118	119	13/32-in.
7/16-in.	111		*	*	*	*	*	*	*	*	*	*	*	*	—	G	116	117	239	118	119	7/16-in.
15/32-in.	—		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	117	239	—	—	15/32-in.
½-in.	112		*	*	*	*	*	*	*	*	*	*	*	—	—	H	116	117	239	118	119	½-in.

The A.G.S. Nos. of the nuts corresponding are shown in the column under Nuts.

Digitized by Google

The following table shows the nearest equivalent of B.A. English and metric bolts (frequently if one is not available, the other can be used) :—

British Association.	Inches.	Inches.	Mm.
B.A. 10	—	·0670	1·7
	1/16	·0625	1·587
B.A. 8	—	·0870	2·209
	3/32	·0937	2·381
B.A. 6	—	·1100	2·794
	7/64	·1094	2·778
B.A. 4	—	·1420	3·606
	9/64	·1406	3·572
B.A. 2	—	·1850	4·699
	3/16	·1875	4·762
B.A. 0	—	·2187	5·555
	7/32	·236	6·0

Drills, Twist.

Comparative Table of Lancashire Wire Gauge, English and Metric Drills.

Lancashire Wire Gauge.	Inches.	Millimetres.	Decimal Inches.	Lancashire Wire Gauge.	Inches.	Millimetres.	Decimal Inches.
—	1/32	—	·031	8	—	5	·197
60	—	1	·039	7	—	—	·199
59	—	—	·040	6	—	—	·201
58	—	—	·041	—	13/64	—	·203
57	—	—	·042	5	—	—	·204
56	—	—	·045	4	—	—	·207
—	3/64	—	·046	3	—	—	·212
55	—	—	·05	—	7/32	—	·218
54	—	—	·055	2	—	—	·219
53	—	—	·058	1	—	—	·227
—	1/16	—	·062	—	15/64	—	·234
52	—	—	·063	—	—	6	·236

Digitized by Google

Drills, Twist—*continued*.

Lancashire Wire Guage.	Inches.	Millimetres.	Decimal Inches.	Lancashire Wire Guage.	Inches.	Millimetres.	Decimal Inches.
51	—	—	·066	—	1/4	—	·250
50	—	—	·069	—	17/64	—	·265
49	—	—	·072	—	—	7	·276
48	—	—	·075	—	9/32	—	·281
47	—	—	·077	—	19/64	—	·296
—	5/64	—	·078	—	5/16	—	·312
46	—	2	·079	—	—	8	·315
45	—	—	·081	—	21/64	—	·328
44	—	—	·085	—	11/32	—	·343
43	—	—	·088	—	—	9	·354
42	—	—	·092	—	23/64	—	·359
—	3/32	—	·093	—	3/8	—	·375
41	—	—	·095	—	25/64	—	·390
40	—	—	·097	—	—	10	·394
39	—	—	·099	—	13/32	—	·406
38	—	—	·101	—	27/64	—	·421
37	—	—	·103	—	—	11	·433
36	—	—	·106	—	7/16	—	·437
35	—	—	·108	—	29/64	—	·453
—	7/46	—	·109	—	15/32	—	·468
34	—	—	·110	—	—	12	·472
33	—	—	·112	—	31/64	—	·484
32	—	—	·115	—	1/2	—	·5
—	—	3	·118	—	—	13	·512
31	—	—	·120	—	17/32	—	·531
—	1/8	—	·125	—	—	14	·551
30	—	—	·127	—	9/16	—	·562
29	—	—	·134	—	—	15	·591
—	9/64	—	·140	—	19/32	—	·593
28	—	—	·139	—	5/8	—	·625
27	—	—	·143	—	—	16	·630
26	—	—	·146	—	21/32	—	·656
25	—	—	·148	—	—	17	·669
24	—	—	·151	—	11/16	—	·687
23	—	—	·153	—	—	18	·709

Digitized by Google

Drills, Twist—*continued.*

Lancashire Wire Gauge.	Inches.	Millimetres.	Decimal Inches.	Lancashire Wire Gauge.	Inches.	Millimetres.	Decimal Inches.
22	—	—	·155	—	23/32	—	·718
—	5/32	—	·156	—	—	19	·748
21	—	4	·157	—	3/4	—	·750
20	—	—	·161	—	25/32	—	·781
19	—	—	·164	—	—	20	·787
18	—	—	·168	—	13/16	—	·812
—	11/64	—	·171	—	—	21	·827
17	—	—	·172	—	27/32	—	·843
16	—	—	·175	—	—	22	·866
15	—	—	·178	—	7/8	—	·875
14	—	—	·180	—	29/32	23	·906
13	—	—	·182	—	15/16	—	·937
12	—	—	·185	—	—	24	·945
—	3/16	—	·187	—	31/32	—	·968
11	—	—	·188	—	—	25	·984
10	—	—	·191	—	1	—	1.0
9	—	—	·194				

Tools, Screw-cutting.

British Association, B.A.

No.	Diameter.		Core Diameter.	Threads per Inch.	Diameter Tapping Drill.	Diameter Clearance Hole.
	Inches.	Deml. in.				
			Mm.		Inches.	Mm.
10	—	·0669	1·28	73	3/64	2·0
8	—	·0866	1·68	59	1/16	2·5
6	7/64	·1102	2·16	48	5/64	3·0
4	9/64	·1417	2·81	38	7/64	4·0
2	3/16	·185	3·73	31	5/32	5·0
0	7/32	·2362	4·8	25	3/16	6·5

Digitized by Google

TOOLS, SCREW-CUTTING—*cont.*

British Standard Fine, B.S.F.

No.	Diameter. Inches.	Diameter. Decimal.	Core Diameter.	Threads per Inch.	Diameter Tapping Drill.	Diameter Clearance Hole.
			Inches.		Inches.	Inches.
	1/4	·250	·2007	26	13/64	9/32
	9/32	·2813	·232	26	15/64	5/16
	5/16	·3125	·2543	22	1/4	11/32
	11/32	·34375	—	22	—	—
	3/8	·375	·311	20	5/16	13/32
	13/32	·406	—	20	—	—
	7/16	·4375	·3664	18	3/8	15/32
	1/2	·5	·420	16	27/64	17/32
			Whitworth.			
	1/4	·250	·1860	20	3/16	9/32
	5/16	·3128	·2414	18	1/4	11/32
	3/8	·375	·2950	16	19/64	13/32
	7/16	·4375	·3460	14	23/64	15/32
	1/2	·5	·3933	12	13/32	17/32
	9/16	·5625	·4558	12	15/32	19/32
	5/8	·625	·5086	11	33/64	21/32
	3/4	·75	·6219	10	5/8	25/32
	7/8	·875	·7327	9	47/64	29/32
	1	1·0	·8399	8	27/32	1 1/32

Metric—French Standard. *Système International.*

No.	"A." Pitch.	"A." Core Diameter.	"B." Pitch.	"B." Core Diameter.
3	·5	2·35	·55	2·29
4	·75	3·03	·7	3·09
5	·75	4·03	·85	3·90
6	1·0	4·70	1·0	4·70
7	1·0	5·70	1·0	5·70
8	1·0	6·70	1·25	6·38
9	1·0	7·70	1·25	7·38
10	1·5	8·05	1·5	8·05
11	—	—	1·5	9·05

Digitized by Google

STANDARD WIRE GAUGE IN INCHES AND MILLIMETRES.

S.W.G. No.	Diameter in Inches.	Diameter in Millimetres.	S.W.G. No.	Diameter in Inches.	Diameter in Millimetres.
4/0	·400	10·155	24	·022	0·559
3/0	·372	9·446	25	·020	0·508
2/0	·348	8·836	26	·018	0·457
0	·324	8·226	27	·0164	0·416
1	·300	7·617	28	·0148	0·376
2	·276	7·008	29	·0136	0·345
3	·252	6·34	30	·0124	0·315
4	·232	5·891	31	·0116	0·294
5	·212	5·383	32	·0108	0·274
6	·192	4·875	33	·0100	0·254
7	·176	4·469	34	·0092	0·234
8	·160	4·062	35	·0084	0·213
9	·144	3·656	36	·0076	0·201
10	·128	3·250	37	·0068	0·173
11	·116	2·945	38	·0060	0·152
12	·104	2·6405	39	·0052	0·132
13	·092	2·336	40	·0048	0·122
14	·080	2·031	41	·0044	0·112
15	·072	1·828	42	·0040	0·101
16	·064	1·625	43	·0036	0·091
17	·056	1·422	44	·0032	0·081
18	·048	1·218	45	·0028	0·071
19	·040	1·015	46	·0024	0·061
20	·036	0·914	47	·0020	0·050
21	·032	0·813	48	·0016	0·040
22	·028	0·711	49	·0012	0·030
23	·024	0·61	50	·0010	0·023

Digitized by Google

Thermometers.

To convert Fahrenheit to Centigrade deduct 32 and multiply by $^5/_9$.

Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.
— 0	32·0	21	69·8	41	105·8
+ 1	33·8	22	71·6	42	107·6
2	35·6	23	73·4	43	109·4
3	37·4	24	75·2	44	111·2
4	39·2	25	77·0	45	113·0
5	41·0	26	78·8	46	114·8
6	42·8	27	80·6	47	116·6
7	44·6	28	82·4	48	118·4
8	46·4	29	84·2	49	120·2
9	48·2	30	86·0	50	122·0
10	50·0	31	87·8	55	131·0
11	51·8	32	89·6	60	140·0
12	53·6	33	91·4	65	149·0
13	55·5	34	93·2	70	158·0
14	57·2	35	95·0	75	167·0
15	59·0	36	96·8	80	176·0
16	60·8	37	98·6	85	185·0
17	62·6	38	100·4	90	194·0
18	64·4	39	102·2	95	203·0
19	66·2	40	104·0	100	212·0
20	68·0				

Rope.

Approximate weight per coil of Manilla rope, in coils of 120 fathoms.

1 fathom = 6 feet.

Circumference. Inches.	Diameter. Inches.	Cwt.	qr.	lb.
$\frac{1}{2}$	$^5/_{32}$	0	0	9
$\frac{3}{4}$	$^1/_1$	0	0	14
1	$^{11}/_{32}$	0	0	24
$1\frac{1}{4}$	$^{13}/_{32}$	0	1	7
$1\frac{1}{2}$	$^1/_2$	0	2	0

Digitized by Google

Circumference. Inches.	Diameter. Inches.	Cwt.	qr.	lb.
2	$^{21}/_{32}$	0	3	8
$2\frac{1}{2}$	$^{13}/_{32}$	1	1	10
3	$^{31}/_{32}$	1	3	20
$3\frac{1}{2}$	$1\cdot\frac{1}{8}$	2	2	14
4	$1\frac{1}{4}$	3	1	20

WIRE, CORD, STEEL.

Strength.	Diameter.	Ft. per lb.	Weight per 100 ft.
	Mm.		Lb. oz.
Bowden Inner No. 11	1·5	133	0 12
5 cwt.	2·0	100	1 0
10 ,, ...	2·8	53	1 14
$12\frac{1}{2}$,, ...	3·0	38	2 13
15 ,, ...	3·6	32	3 2
20 ,, ...	4·1	27	3 12
25 ,, ...	4·5	20	5 0
30 ,, ...	4·9	18	5 10
35 ,, ...	5·1	16	6 4
40 ,, ...	5·4	13	7 13
45 ,, ...	5·9	$11\frac{1}{2}$	8 12
50 ,, ...	6·1	10	10 0
60 ,, ...	6·7	9	11 4
70 ,, ...	6·9	8	12 6

French Nieuport.—10 cwt. = 3 mm., 35 cwt. = 3·8 mm., 45 cwt. = 4·5 mm., 60 cwt. =5·0 mm.

FULL MOON, 1918.

The dates of full moon for the year are given below. By adding 15 to these dates, the approximate date of the new moon can be obtained. During "summer time" the moon is full one hour later than shown.

January 27th	3.14 a.m.	July 23rd	8.35 p.m.
February 25th	9.35 p.m.	August 22nd	5.2 a.m.
March 27th	3.33 p.m.	September 20th	1.1 p.m.
April 26th	8.5 a.m.	October 19th	9.35 p.m.
May 25th	10.32 p.m.	November 18th	7.33 a.m.
June 24th	10.38 a.m.	December 17th	7.18 p.m.

Digitized by Google

Altitude.

Metres.		Feet.	Metres.		Feet.
1	....	3·280	3,000	....	9,842·4
2	....	6·561	3,500	....	11,482·8
5	....	16·404	4,000	....	13,123·2
10	....	32·809	4,500	....	14,763·2
50	....	164·04	5,000	....	16,404·0
100	....	328·09	5,500	....	18,044·4
250	....	820·14	6,000	....	19,684·8
500	....	1,640·4	6,500	....	21,325·2
1,000	....	3,280·8	7,000	....	22,965·6
1,500	....	4,921·2	7,500	....	24,606·0
2,000	....	6,561·0	8,000	....	26,246·4
2,500	....	8,201·4			

Equivalents of Imperial and Metric Weights and Measures

Linear Measure.

Imperial.		Metric.	
1 inch	= 25·4 millimetres.	1 millimetre (mm.).	= 0·03937 in.
1 foot	= 0·3048 metre	1 centimetre ($^1/_{100}$ m.).	= 0·3937 in.
1 yard	= 0·914399 metre	1 decimetre ($^1/_{10}$ m.).	= 3·937 ins.
1 mile	= 1·6093 kiloms.	1 metre (m.)	= 39·370113 ins. 3·280843 ft. 1·0936143 yds.
		1 kilometre (1,000 m.)	= 0·62137 mile.

Square Measure.

1 sq. in.	= 6·4516 sq. centimetres.	1 sq. centimetre	= 0·15500 sq. in.
		1 sq. metre	= 10·7639 sq. ft. 1·1960 sq. yds.
1 sq. yd.	= 0·836126 sq. metre.		

Cubic Measurement.

1 cub. in.	= 16·387 cub. centimetre.	1 cub. centimetre	= 0·0610 cub. in.
1 cub. ft.	= 0·028317 cub. metre.	1 cub. decimetre (c.d.)	= 61·024 cub. in.
1 cub. yd.	= 0·764553 cub. metre.	1 cub. metre	= 35·3148 cub. ft. 1·307954 cub. yds.

Digitized by Google

Measure of Capacity.

1 pint = 0·568 litre .... 1 litre .... 1·75980 pints.
1 gallon = 4·5459631 litres.

Weight.

1 lb. (7,000 grains) = 0·45359243 kilogram.
1 kilogram (1,000 grm.) = 2·2046223 lb.
1 ton = 1,016 kilograms.

COMPARATIVE TABLE.

Inches and Millimetres.

Fraction Inches.	Decimal Inches.	Milli-metres.	Fraction Inches.	Decimal Inches.	Milli-metres.
—	·001	·025	—	·1000	2·540
—	·002	·050	7/64	·1094	2·778
—	·003	·076	—	·1181	3·00
—	·0039	·100	1/8	·1250	3·175
—	·004	·101	9/64	·1406	3·572
—	·005	·127	—	·1500	3·810
—	·006	·152	5/32	·1562	3·969
—	·007	·177	—	·1575	4·00
1/128	·0079	·200	11/64	·1719	4·365
—	·008	·203	3/16	·1875	4·762
—	·009	·228	—	·1968	5·00
—	·010	·254	—	·2000	5·080
—	·0118	·300	13/64	·2031	5·159
1/64	·0156	·3968	7/32	·2187	5·556
—	·0157	·400	15/64	·2344	5·953
—	·0197	·500	—	·2362	6·00
—	·0236	·600	1/4	·2500	6·350
—	·0276	·700	17/64	·2656	6·745
1/32	·0312	·794	—	·2756	7·00
—	·0315	·800	9/32	·2812	7·144
—	·0354	·900	19/64	·2968	7·540
—	·0394	1·00	—	·3000	7·620
3/64	·0469	1·191	5/16	·3125	7·937
—	·0500	1·270	—	·3150	8·00
1/16	·0625	1·587	21/64	·3281	8·334
5/64	·0781	1·984	11/32	·3437	8·731
—	·0787	2·00	—	·3500	8·890
3/32	·0937	2·381	—	·3543	9·00

Digitized by Google

Comparative Table—*continued*.

Inches and Millimetres.

Fraction Inches.	Decimal Inches.	Millimetres.	Fraction Inches.	Decimal Inches.	Millimetres.
23/64	·3594	9·128	43/64	·6719	17·065
3/8	·3750	9·525	11/16	·6875	17·462
25/64	·3906	9·921	—	·7000	17·780
—	·3937	10·00	45/64	·7031	17·859
—	·4000	10·160	—	·7087	18·00
13/32	·4062	10·319	23/32	·7187	18·256
27/64	·4219	10·716	47/64	·7344	18·652
—	·4331	11·00	—	·7480	19·00
7/16	·4375	11·112	3/4	·7500	19·050
—	·4500	11·430	49/64	·7656	19·446
29/64	·4531	11·509	25/32	·7812	19·843
15/32	·4687	11·906	—	·7874	20·000
—	·4724	12·00	51/64	·7969	20·240
31/64	·4844	12·303	—	·8000	20·320
1/2	·5000	12·700	13/16	·8125	20·637
—	·5118	13·00	—	·8268	21·00
33/64	·5156	13·096	53/64	·8281	21·034
17/32	·5312	13·493	27/32	·8437	21·431
35/64	·5469	13·890	—	·8500	21·590
—	·5500	13·970	55/64	·8594	21·827
—	·5512	14·00	—	·8661	22·00
9/16	·5625	14·287	7/8	·8750	22·225
37/64	·5781	14·684	57/64	·8906	22·621
—	·5906	15·00	—	·9000	22·859
19/32	·5937	15·081	—	·9055	23·00
—	·6000	15·240	29/32	·9062	23·018
39/64	·6094	15·478	59/64	·9219	23·415
5/8	·6250	15·875	15/16	·9375	23·812
—	·6299	16·00	—	·9449	34·00
41/64	·6406	16·271	—	·9500	24·129
—	·6500	16·510	61/64	·9531	24·209
21/32	·6562	16·668	31/32	·9687	24·606
—	·6693	17·00	63/64	·9842	25·000
			1	1·0000	25·400

Digitized by Google

Metres to Feet.

Metres.	Feet.	Metres.	Feet.	Metres.	Feet.
1	3·2808	11	36·09	21	68·9
2	6·562	12	39·37	22	72·18
3	9·442	13	42·65	23	75·46
4	12·123	14	45·93	24	78·74
5	15·404	15	49·21	25	82·02
6	18·685	16	52·49	30	98·42
7	21·966	17	52·77	35	114·83
8	25·256	18	59·05	40	131·23
9	28·537	19	62·33	45	147·63
10	32·81	20	65·62	50	164·04

Miles, Kilometres and Knots.

Miles.	Kilo-metres.	Knots.	Miles.	Kilo-metres.	Knots.
·621	1·	·539	8·060	13·172	7·
1·	1·609	·8684	9·	14·484	7·815
1·1515	1·853	1·	9·212	14·824	8·
1·246	2·	1·078	9·322	15·	8·085
1·864	3·	1·617	10·	16·09	8·684
2·	3·219	1·736	10·363	16·878	9·
2·253	3·706	2·	11·515	18·531	10·
2·486	4·	2·156	12·43	20·	10·78
3·	4·828	2·605	15·	24·140	13·02
3·107	5·	2·695	15·537	25·	13·475
3·454	5·559	3·	17·272	27·797	15·
3·729	6·	3·234	18·645	30·	16·17
4·	6·437	3·473	20·	32·18	17·368
4·350	7·	3·773	21·752	35·	18·865
4·606	7·412	4·	23·030	37·062	20·
4·972	8·	4·312	24·86	40	21·56
5·	8·047	4·342	25·	40·233	21·71
5·593	9·	4·851	27·967	45·	24·256
5·757	9·265	5·	28·77	46·329	25·
6	9·645	5·210	30·	48·27	26·052
6·215	10·	5·390	31·075	50·	26·95
6·909	11·118	6·	34·545	55·594	30·
7·	11·265	6·078	35·	56·31	30·39
8·	12·874	6·947	37·290	60·	32·34

Digitized by Google

Miles, Kilometres and Knots—continued.

Miles.	Kilo-metres.	Knots.	Miles.	Kilo-metres.	Knots.
40	64·37	34·736	80·	128·74	69·472
40·302	64·859	35·	80·605	129·718	70·
43·505	70·	37·73	90·	144·83	78·156
45·	72·415	39·07	92·120	148·249	80·
46·062	74·125	40·	93·225	150·	80·85
49·720	80·	43·12	100·	160·92	86·84
50·	80·464	43·420	103·635	166·781	90·
52·8	83·390	45·	108·762	175·	94·325
55·935	90·	48·51	110·	177·02	95·524
57·575	92·656	50·	115·15	185·312	100·
60·	96·55	52·104	124·301	200·	107·8
62·150	100·	53·9	125·	201·16	108·55
69·090	111·187	60·	139·8	225·	121·27
70·	112·65	60·788	143·9	231·6	125·
77·685	125·	67·375	150·	241·35	130·26

Pounds per sq. ft. in Kilogrammes per sq. metre.

Lbs. per sq. ft.	Kilogrammes per sq. metre.
1	4·88
1·1	5·37
1·2	5·86
1·3	6·35
1·4	6·84
1·5	7·32
1·6	7·81
1·7	8·3
1·8	8·79
1·9	9·27
2	9·76
3	14·65
4	19·53
5	24·41
6	29·3
7	34·18
8	39·06
9	43·94
10	48·83

Digitized by Google

Kilogrammes per sq. metre in lbs. per sq. ft.

Kilogrammes per sq. metre.	Lbs. per sq. ft.
5	1·02
10	2·05
20	4·09
30	6·14
40	8·19
50	10·24
60	12·28
70	14·33
80	16·38
90	18·42
100	20·47

Rate of Climb.

Feet per Minute in Metres per Second.

Feet.	Metres.
25	0·127
50	0·254
75	0·38
100	0·51
200	1·02
300	1·52
400	2·03
500	2·54
600	3·05
700	3·56
800	4·06
900	4·57
1,000	5·08
2,000	10·16

Metres per Second in Feet per Minute.

Metres.	Feet.
5	98·43
1	196·85
2	393·71
3	590·56
4	787·42
5	984·27
6	1,181·21
7	1,377·98
8	1,574·83
9	1,771·69
10	1,968·54

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

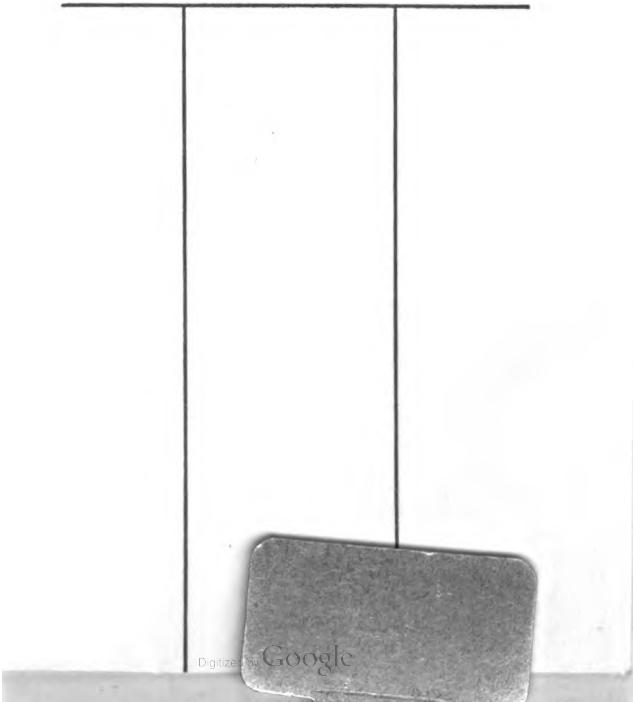
Digitized by Google

UG 635 .G7 A4 1918
R.A.F. field service pocket bo
Stanford University Libraries
3 6105 041 663 746

UG
635
G7A4
1918

Stanford University Libraries
Stanford, California

Return this book on or before date due.



Digitized by Google

Digitized by Google